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ABSTRACT

Included in this guide are ideas on evaluation and conduct of outdoor education classes and unit guides and lesson plans. An interdisciplinary approach is emphasized and the unit guides and lesson plans present activities related to science, mathematics, social studies, art, and music relevant to outdoor education in general. Unit guides for soil, water, forestry, and "balance of nature" are given, usually for primary, intermediate, junior and senior high school grades. Lesson plans suggest how these topics may be studied. Supplemental material describing plant and animal communities include many activities suitable for outdoor use. A bibliography of conservation, outdoor education, ecology texts and field guides is included. This work was prepared under an ESEA Title III contract. [Not available in hardcopy due to marginal legibility of original document.] (AL)

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A
TEACHER'S GUIDE
TO
RESOURCE - USE OUTDOOR EDUCATION CENTER

Perry, Florida

serving

Dixie, Jefferson, Lafayette, Madison
Suwannee, and Taylor Counties

an

ESEA Title III
Project.
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FOREWORD

The preparation of this guide is intended to provide information to introduce and generally explain the services of the Resource - Use Outdoor Education Center. An attempt has been made to cover many important aspects of the Center; but, in the event some important questions are still unanswered, the questions should be forwarded to the Center.

This guide is the result of experiences and work completed at the project area teachers' workshop. The purpose of the workshop was to use selected teachers to develop and help plan curricular materials, units and methods for participation by primary, intermediate, junior and senior high school students in a program of resource - use outdoor education at the Center. There was also a need to introduce the teachers of the project area to the many uses of the Outdoor Laboratory in the teaching and learning process.

The material presented here is only a beginning of materials and services that will be offered in the future to the students, teachers, administrators, and general public of the project area and others interested in the Resource - Use Outdoor Education Center and its many services.

INTRODUCTION

Informal discussions started in the fall of 1965 on the establishment of the Resource - Use Outdoor Education Center. In April 1966, the planning grant was approved and the planning for the Center started. In June 1967, the Taylor County Board of Public Instruction was awarded a Title III Grant under the Elementary and Secondary Education Act of 1965, authorizing the establishment of the Resource - Use Outdoor Education Center in Taylor County.

The project area to be served under the grant covers the counties of Dixie, Jefferson, Lafayette, Madison, Suwannee and Taylor in North Florida.

The Taylor County Board of Public Instruction is the administering authority for the Grant. To administer the project a coordinating committee was formed; consisting of supervisory personnel of the six county project area, a representative of the Chamber of Commerce and development authority, Florida Forest Service, State Department of Education, Florida State University, Industry (Buckeye Cellulose Corporation), Taylor County Board of Public Instruction and the superintendent who will act as an ex-officio member.

The function of the Coordinating Committee is to establish and periodically review policy and implementation of the program; establish lines of communication that will facilitate the maximum participation in the Center; review and recommend qualifications and staff to the superintendent and to aid the project director.

The Grant was tentatively approved for three years. The initial year of operation will go through June 30, 1968. The second year of operation will depend primarily upon the success of the initial year of operation.

The project director was appointed in September. The staff for the first year's implementation consists of the Director, Farm and Game Manager, Secretary - Bookkeeper, and maintenance personnel.

The office facilities for the staff are temporarily located in the supervisory offices on North Calhoun Street, Perry, Florida. The offices will be moved later to the Center site as development progresses. The mailing address for the Center is P. O. Box 938, Perry, Florida 32347, telephone 458-0821.

The Center (the Outdoor Laboratory) is located on a 118 acre tract of land four and a half miles west of Perry, Florida on U S Highway 98 and Florida route 356 at the site of the Old Hampton Springs Hotel. The tract of land is one-fourth mile wide and three-fourths mile long. The site contains piney flatwoods, Cypress ponds, dense scrub, a mineral spring (Hampton Spring), roads, swamp, and a creek boarded with hardwoods and lowlands typical of the Florida landscape.

The primary purposes of the project are: to encourage and enable greater use of the natural environment - the out of doors, by teachers and pupils; to supply consultants and specialists where services are required for special programs and specific activities; and to plan a model or demonstration program for other communities interested in similar programs.

Funds are available on a proportionate basis for reimbursement to participating counties on a mileage basis for transportation. This will include day trips for students to the center site and teacher workshops.

Requests for information concerning suggested field trip activities and scheduling of the center site, which are feasible for your particular programs, should be directed to the director of the Center.

We hope you will join with us in our efforts to explore the exciting outdoor education experience. Perhaps we can find some new ways to make our teaching more effective through the use of the living laboratory and at the same time create an environment which demonstrates the wise use of our total heritage.

PROGRAM AND FACILITIES

The program and facilities for the Outdoor Education Center is planned to serve the population of six counties listed in the project plans. Specifically, the program must serve the needs of teachers, students and the population in general in resource - use outdoor education. The focus will be on new and experimental instructional methods in the field of conservation. It is proposed to plan a model or demonstration center for other communities interested in similar programs.

The program is designed to demonstrate innovative and exemplary ideas and practices in outdoor education and resource - use education. The values of learning experiences in the outdoors have long been recognized as evidenced by the popularity of camping and the wide interest in many outdoor activities. The use of the outdoors as an educational laboratory and emphasis on conservation and resource - use education are not new, but the need for these developments in the curriculum is urgent.

The fact that this generation of children, youth, and adults know little, if anything, about the natural environment and their relationship to it gives added impetus to outdoor education as an integral part of the school curriculum.

Because of a natural involvement of the masses of children in the public schools, the schools offer a practical medium for giving the people a knowledge and an understanding of man's environment and his place in it and, hopefully, of educating youth to preserve and improve their environment.

The unique contribution of outdoor education is a means of curriculum enrichment through learning experiences in and for the outdoors.

Outdoor Education is not a separate discipline with prescribed objectives like science and mathematics; it is simply a learning climate which offers opportunities for direct laboratory experiences in identifying and resolving real-life problems, for acquiring skills with which to enjoy a lifetime of creative living, for attaining concepts and insights about human and natural resources, and for getting us back in touch with those aspects of living where our roots were once firmly established.

Some of the specific contributions of an outdoor setting to learning and to the enrichment of the curriculum are:

1. Increases the power of observation.

2. Stimulates interest and improves the quality of experience.
3. Provides opportunities to acquire outdoor skills.
4. Extends the classroom beyond the four walls.
5. Offers opportunities for exploration and research.
6. Provides new area for verbalizing and communication.
7. Helps supply knowledge and adds mastery.
8. Broadens scope of teaching ability and knowledge of teacher.

Principles and Basic Objectives

A. Maximum use should be made of the natural environment and the facilities, yet preserve the integrity of the land and natural resources.

B. The learning experiences should help in the understanding and appreciation of the natural resources of the area and their contributions to the well-being of people.

C. The program should extend and supplement the classroom.

D. Through action research the best instructional practices and learning materials should be used in order to provide effective educational experiences in outdoor and resource-use education for the area.

E. The program and materials at the Center should provide an excellent setting for in-service education of teachers and in acquiring effective methods of instruction.

Program Structure and Facilities

The program for the Outdoor Education Center has two divisions: (A) Program for schools, including community service and continuing education; and (B) teacher education.

A Program for Schools, Community Service and Continuing Education

This phase of the program includes a range of educational activities from pre-school education through the community college. The land and facilities will serve as a learning center to extend and enrich the offerings of the schools in the region, with particular reference to outdoor and resource-use education. The program patterns will include the following:

1. Outdoor laboratories, which may be used by all segments of the curriculum for field experiences, exploration, and research. The facilities and instructional devices will include:

   a. A system of nature trails
   b. Interpretive center
   c. Library and media center
   d. Outdoor skills and sports area
   e. Craft center
   f. Conservation plots

g. Laboratories and workrooms for special interests and study groups, such as outdoor photography, science, and others.

2. Outdoor schools, whereby classrooms and special interest groups may have a sustained experience in a group camp at the Center (several days or a school week). This program is comparable in type to those conducted by many other school districts throughout the United States.

3. Community Service and Continuing Education, for which the program of the center makes provision to serve the educational needs of the larger community and for the individual communities in the school districts. The program is designed for all age groups and includes:

a. Nature center for observation and study
b. Conference center for continuing education
c. A center for demonstrations and clinics of various kinds of outdoor activities and skills
d. An observation center to see an educational program for children and youth in action.

B. Teacher Education

Education in the outdoors, with reference to teacher education, is well described by Campbell Loughmiller in Wilderness Road, "Educationally, the program is 'life wide.' Academically, it is an experience curriculum which includes the learning one gets in the classroom and more."

An outdoor laboratory has a unique function for teacher education. The natural environment has a major influence on the quality of learning experiences because:

a. The tools of learning in the laboratory, i.e., living things, are in their natural context.
b. All the senses may be employed in the learning process and in sharpening the perceptive powers of the learner.
c. It is more conductive to exploration and the problem-solving approach to learning.
d. There are more opportunities for the teacher and children to become co-performers in solving problems.

The realness of the outdoor classroom, with little need for artificiality and abstractions, makes it more possible to guide many learning experiences in accordance with the best that is known about the nature of learning. Furthermore, in the formal and out-of-classroom situation, both the teacher and the student can behave as normal human beings in real life situations. The whole child learns in the whole situation, making it unnecessary to "pigeon hole" learning or to take the physical world apart.

A laboratory center makes it possible to combine theory and practice, subject matter and behavior, and teaching and learning. Such a center or laboratory as herein proposed combines the best information by way of books, instructional materials, and media resources with a learning situation involving children and a teaching clinic. Thus the laboratory center provides rich resources, by way of leadership and materials, and yet makes the teacher the central figure in the learning situation with children.

An added value in the outdoor laboratory is to bring into focus the best techniques in the use of resources, teachers, and specialists with a strengthening of the role of each.

OBJECTIVES OF OUTDOOR EDUCATION

1. To provide a method for integrating specific subject matter areas
2. To reinforce classroom learning through actual experience
3. To provide children with an appreciation of nature and the world about them
4. To provide an interesting method of presenting curriculum
5. To enrich the existing curriculum
6. To provide motivation for classroom learning

Outdoor Education is a method of teaching--it is not a subject in itself, but rather uses all subject areas. There are parts of the curriculum that can best be taught in the out of doors. It is not a new idea in education, but one which has always been used by creative teachers. Outdoor Education is not an attempt to do away with the classroom, but rather to broaden the scope of enrichment in teaching and better prepare children for living in our world. Children, wherever they live and whatever they do, in and out of school, meet problems that involve both experiences and understandings. They achieve these understandings best through first-hand experiences and actual, purposeful contacts with materials, forces and processes that affect their own lives.

To be effective, teaching must be closely related to circumstances that will arise outside the classroom. Young, or old, we learn best by doing. The more realistic the learning activity is, the more meaningful and lasting will be the lesson. There is little justification for merely looking at something which can be touched and handled or used, or for just textbook presentations when the real life situtations are at hand. In the outdoor laboratory, the pupil may, through observation and direct experience, develop appreciations, skills and understandings that will supplement the indoor curriculum of the school. Outdoor Education, then, has become a practical approach to aspects of those subjects which are normally taught only in the classroom. Outdoor Education is the effective utilization of the natural environment to help promote the growth, welfare and total education of the student.

Metropolitan Nashville-Davidson County Schools, Outdoor Education Manual. Nashville, Tennessee: Metropolitan Nashville-Davidson County Schools, 1966.

SUGGESTIONS FOR EVALUATION OF OUTDOOR EDUCATION EXPERIENCES

(Adapted from Southern Illinois University - Dr. Tom Rillo)

A. Suggested evaluations for observation:

1. Were the objectives for the day clearly planned, stated, and understood by all?
2. Was the group adequately prepared?
3. How large was the group? (ratio of leader to the pupils)
4. Were the group objectives flexible enough to permit unplanned learning activities?
5. Were all of the children actively involved in the learning process? (learning by doing)
6. Did they appear to be having fun at the same time that they were learning?
7. Did the leader provide too many answeres to the children's questions?
8. Was the atmosphere of discovery, exploration, and problem solving evident?
9. How well did the group seem to understand the vocabulary and concepts presented?
10. Did the lessons appear to hold the children's interest?
11. Was the length of time adequate for each lesson taught?
12. Were the uses of many of the five senses utilized in the learning process?
13. Did the leader have adequate control and supervision in guiding the children's learning experiences?
14. Were necessary safety precautions observed when walking through the woods and fields?
15. Do you feel that those lessons taught in the out-of-doors were best learned there rather than in a classroom?
16. Were some of the learning experiences correlated with what was being studied in the classroom?

B. Evaluation of individual student participation

1. Teachers may choose written evaluation on content areas.
2. Teachers should observe participation.
3. Evaluate concepts taught--not specific content.

Evaluation of the program of Outdoor Education can only come as the teacher sees the children approach the problems and ideas with understandings and awareness. The teacher, herself, will be the best judge of whether the outdoor experience has enriched the individual child and his knowledge.

TEACHING OUTDOORS TECHNIQUES

(Adapted from Southern Illinois University - Dr. Tom Rillo)

Problem solving situations in Outdoor Education:

1. Criteria for the selection of the problems
    - a. The problems should involve the conservation of plants, animals and other physical and cultural resources.
    - b. The problems should be most effectively examined in the outdoors environment.
    - c. The solving of the problems should take a maximum of two or three hours in the out-of-doors.
    - d. The problems should be suitable for solving by intermediate and junior level pupils.
    - e. The equipment necessary for solving the problems should be available through borrowing, inexpensive purchasing or construction by teachers or students.

2. Size of group should be kept small, when possible

Classes may be organized into committees to work on different aspects of the problems to be solved.

3. Sites available for Outdoor Education
    - a. school grounds
    - b. community walks
    - c. field trips
    - d. day center
    - e. outdoor school for more than one day's study

DEVELOPING CONCEPTS IN OUTDOOR EDUCATION

By Elizabeth Roller, Consultant

Outdoor Education
Metropolitan Public Schools
Nashville, Tennessee

Outdoor Education is not a subject but a method of teaching. The activities should enrich classroom experiences in concepts that can better be taught in the out of doors. The imaginative use of outdoor activities can stimulate interest in all curriculum areas. The key work in all of these activities is involvement of the child in the activities. All of the senses can be used in a multi-sensory approach that brings the reality of subject matter directly to the student.

Most teachers are afraid to get away from the four walls of the classroom. They feel that discipline might be a problem in a more informal setting but usually if a child is involved in an activity, he has no time to be a problem. Limits must be set and rules understood but this would be true in any activity done by students.

The feeling of insecurity in the areas that can be taught in the out of doors merely leads to different techniques of teaching. The teacher learning with the children, the use of the question method of seeking out the answer, never giving it for the key to creativity, and originality.

The out of doors can be a lab where children can come into contact with the real thing, the direct method that educators have so long maintained is necessary to good teaching. All of the school subjects can lose their single area boundaries and show the inter relationship that is so important if we are to fully understand the world about us. By utilizing the unsurpassed "classroom" that is the out of doors many concepts that become difficult to teach within four walls come alive for the children. These concepts and learnings must start from a need within the lessons then move to the out of doors for experiences and returning to the classroom for follow up on unanswered questions and future learning. An outdoor activity without proper planning has little value. It is merely one more activity in a day's work; but a planned activity, based on a concept to be learned and one that can involve the students will go far in teaching the mass of knowledge needed in today's society. "There are some things that are best taught out of doors, and there they should be taught".

TEACHING OPPORTUNITIES IN OUTDOOR EDUCATION

By C. Richard Tillis, Director

Pine Jog Conservation Education Center
West Palm Beach, Florida

I am thrilled at this opportunity to talk with you about teaching opportunities in outdoor education. Here is an opportunity to bring real intellectual fire into your classes. A world of new concepts heretofore unattainable within the confines of the four walls of a classroom become available through outdoor experiences. We all know that the real rewards of teaching come when we see our students gain new ideas. No teacher likes to teach the same things the students have heard over and over again.

Before I begin, the term concept has been used many times in our discussions and by previous speakers, and I believe we should establish exactly what we mean. When we hear the word "kitchen" we know in a split second exactly what the speaker means. If we take the time to analyze our thoughts we recognize that "kitchen" calls to mind a room with sink, stove, cabinets, etc. This is our concept of a kitchen. Now suppose I show you a picture of a kitchen with a grand piano smack in the middle of the floor. This would be a discordant observation for you. It would create a cognitive conflict. Now, if we took the time we could arrange materials and lessons and eventually change your concept of a kitchen so that "kitchen" would call forth room, sink, stove and grand piano. This would be a changed or new concept. This is important because concept creation and concept modification is our job.

Children in this area have a concept of the Fenholloway River (developed gradually) as a sewer. In your own words "it stinks." We must create in our students' minds a concept of a river as clean, sparkling, and healthy; useful for swimming, fishing, boating. Then the polluted Fenholloway will be a discordant observation just as the grand piano in the kitchen in my explanation.

The same thing is true of our polluted air and race to pave over the land. More than 1% of the land in the United States is paved over right now, and we are moving to pave more. All of this concrete blocks the normal water cycle and of course allows no plant life. Without plant life we have no photosynthesis occurring and no oxygen being generated to counteract the tremendous quantity of carbon dioxide gas given off by industry, automobiles, jet airplanes and just plain people. Last year we dumped 130 million tons of trash into our air. Oxygen is necessary for the decomposition of these carbon particles, chemicals, and other microscopic materials. Geiger tells us in his Climate Near the Ground that air downwind of a forest has less dust particles per unit area than air upwind of it. The forest actually serves as dust traps to clean our air, yet we are racing to remove them and pave over the land.

Now let's look at a few examples of things we can do in the classroom, both indoors and outdoors. I have always believed that the best way to determine a teacher's objectives and effectiveness is to look at her tests. Here is a test from a fourth grade class in Palm Beach County. Let's look at a few of the questions and see what the teacher taught.

Question No. 1. Give a reason why the land near the pyramids is now desert instead of a rich nation like America. Child's answer: The people did not know that plants, animals, and soil are all needed if either plants, animals, or soil is to remain.

Now let's look at the concepts evidenced by this fourth grade student's answer. The child knew that the pyramids were the tombs of the kings of nations in the area now occupied by Egypt. He knew that King Tut was found in a huge, gold coffin. He was unusual in the general American public in that he now sees the pyramids as objects which have stood for thousands of years to remind us that prosperous, influential nations which once existed in these areas have long since disappeared and left these miracles of architecture and desert sand to remind the enlightened individual that great nations can disappear. Historians and archeologists give us many theories to explain the downfall of these kingdoms, but every one of them can be traced back to the unwise use of resources and the ravishing of the land. In the child's answer, recognition that plants, animals and soil are needed if either of the three is to continue to exist is a crucial concept in conservation education.

Let's look at another question: Animals depend on soil because. Child's answer: They need the food and cover provided by plants and plants cannot grow without soil. Here the child has abstracted one level from soil to animal. He has stretched his mind a little bit and has begun to move toward the establishment of a personal land ethic.

Another question: Soil depends on plants because. Child's answer: Without plants growing in it soil is washed away by the rain or blown away by the wind. The concept here is erosion and the child shows a clear understanding of it and its relationship to plant cover.

Question: An animal that eats another animal is called a. Child's answer: Predator. Here the child indicates that he understands the basic idea of a predator-prey relationship. There is no connotation of good or bad here, only an understanding that animals eat other animals or plants of necessity.

Another question: The main predator on rabbits in the West Palm Beach, Florida, area is the. Child's answer: Diamondback rattlesnake. Here the child tells us that he understands that development of the wilderness areas around populous Palm Beach County has driven off foxes, bobcats, panthers, most of the hawks and owls, and the other normal predators on rabbits and other small mammals. This situation has left us with one main predator on rabbits, a secretive animal that can live in low shrubs and with very little plant cover -- the diamondback. This child sees that we have unintentionally selected out that type of predator which we least desire in our area.

The above examples graphically illustrate some of the objectives and accomplishments of in-class plus outdoor experiences in the area of conservation education.

Let's take another look and see just how exciting conservation education can be. Suppose we have a class of children consider a 10 lb. bass. Next we ask them what bass eat. They can tell us this because of their fishing experiences. They have either used live bait or lures that resemble live bait. Now let's lead them to understand that bass eat bream. There is a food-to-weight ratio found in nature which goes like this. For each pound the animal weighs he has consumed 10 lbs. of food. Now if our bass weighs 10 lbs. the children can quickly apply this 10-to-1 ratio and tell us that it has eaten 100 lbs. of bream. Now what we must teach them is that in nature we can never remove all of the fish from the pond but must leave twice as much as we take for breeding and feeding purposes. This means that we must leave 200 lbs. The class can quickly tell us that it actually takes 300 lbs. of bream to produce one 10 lb. bass.

Now we would lead the children through a short food chain to see that the bream depend basically on plankton for their food. The children can conceive of plankton as being tiny microscopic plants and animals. They can use a nylon stocking as a plankton net and see a green smudge that represents millions of these tiny plants. Now let's apply our food-to-weight ration to the plankton. They will quickly tell us that it takes 3,000 lbs. of plankton to produce one 10 lb. bass.

Now, what does it take to produce plankton -- water -- clean water -- plenty of it. Now the children can understand why they have never caught a 10 lb. bass, and bass of this size are close to records. Now they have been led through a series of intellectual developments to a practical understanding of a prime conservation objective -- clean water.

We can run quickly through the next step with such an approach. We have a child who weighs 100 lbs. He has had to consume 1,000 lbs. of steak. This 1,000 lbs. plus breeding and feeding stock means that 3,000 lbs. of cattle were necessary to produce our 100 lb. student, and following the same logic, 30,000 lbs. of grass were necessary to produce this one 100 lb. boy or girl.

What is necessary to produce 30,000 pounds of grass? Land -- acres and acres of land -- and now the children begin to see that their mothers' purchase of a 10 lb. roast is tied directly to the precious substance called soil somewhere in America, and again has moved toward the development of a land ethic.

We could go on like this all day. Conservation taught through indoor and outdoor experiences is actually a system of attitudes and behaviors that will give rise to a sustained yield of our natural resources. It involves observations, measurements, abstract reasoning, inference, and, in effect, the total range of our intellectual tools, and as such it fits perfectly into any kind of indoor or outdoor subject classification.

Prior speakers have clearly explained an idea that I would like to repeat for you in one of my pet phrases, "Words suffice in a world of words, but fail in a world of things." Conservation education deals with things, out-of-door things, and as such it cannot be successful within the confines of an indoor classroom. Out-of-doors experiences are essential.

In closing, another pet phrase. Sound data allows us to predict that by 2,000 the United States will have a population of 300 million. Worldwide we are doubling our population every 36 years. We have available to man a fixed quantity of resources. With these things in mind we can surely see that conservation education is "As necessary as air, as right as rain, and as real as rock."

OUTDOOR EDUCATION - AN INTERDISCIPLINARY APPROACH

By John McDevitt, Math and Science Consultant

North Florida Consultant Service
Madison, Florida

The schools of our nation have been long in ridding themselves of the structure inherited from the Latin Grammar School. The result has been an educational system that meets the needs of few of our youth. The inadaquacies of the present approaches are quite apparent in our area, where adopted texts, Carnegie Units, and rigid schedules masquerade for education.

The Outdoor Education Center promises a way out of the dead end street that we find ourselves in. It can provide experiences that serve to broaden the horizons of our students, breaking with tradition so completely that it will be quite difficult for well meaning but misguided school personnel to structure the children's and teacher's experiences into the same old mold that is proving so inadaquate in our present system.

There is always the possibility that the old interdisciplinary rivalries, the fixed notions of what constitutes "educational experience" will undermine even this fine effort. The battle will be decided primarily by the teachers involved. If you can be flexible enough to let the children experience without intimidation, if you have sufficient immagination to help the student find new meanings from an experience centered approach to all the disciplines, then the Center will be of benefit. If you are not up to the task, then a very worthwhile educational enterprise will fade away.

UNIT ON WATER

PRIMARY GRADES

Concepts: To teach the need for conservation of water and its uses.
To show how plants depend upon water for life and growth.

Objectives:

1. To show that some plants need less water than others.
2. To compare plants in damp soil with those that live in sandy soil.
3. To show how plants get water from the soil.

Activities:

1. Divide the class into small groups on campus site.
2. Select one plant in a dry place, moist place and one in a wet place.
3. Compare the root system (Use a shovel to lift the roots from the soil carefully).
4. Take soil from different depths and compare the amount of moisture in it by squeezing.
5. Find out how fast water soaks into the ground at different places.
6. Plant seeds in different containers and apply different amounts of water. (purpose: to show the effect that varying amount of water have on seeds and growing plants.)
7. Plan and take a trip to the Resource Center in Perry to observe various kinds of plants growing in different kinds of soil and moisture.

Discuss limitation of our immediate area. Therefore, we may take this trip to further prove our concepts.

Vocabulary:

1. conservation
2. soil
3. moisture
4. system
5. resource
6. select
7. depend
8. shovel
9. roots

Materials:

1. shovel
2. jars for soil
3. hand lenses
4. mirror
5. seeds
6. field books
7. resource personnel

UNIT ON FORESTRY

INTERMEDIATE GRADES

Concept: Trees are Different

Observation with clue chart:

- a. shape
- b. size
- c. height
- d. fruit
- e. bark
- f. flowers
- g. feel (leaves - bark)
- h. smell (leaves - bark)

Activities:

- a. determine age
- b. use of clue chart
- c. estimating height
- d. survey number and kind of trees
- e. sketch trees
- f. measuring the distance around the tree and through the center
- g. write up the findings
- h. bulletin board display of findings
- i. art project involving use of materials found on the play ground

Equipment:

- a. clue chart
- b. biltmore stick
- c. tape measure
- d. bags
- e. hand lenses
- f. increment borer
- g. paper and drawing pencils

UNIT ON WATER

GRADES 7 - 12

Introduction:

Water, sunshine, soil and air are necessary for life to exist. Without these three would be no plants or animals, including man. There is little we can do to increase or decrease the amount of useful sunshine or air available to us. Water, to some extent, just as soil, is subject to our control. We can do certain things to insure that we have plenty of clean water at all times. In order to do these things we must know why water is so important to us, where it comes from, and what happens to it after we use it. In this unit we will search for an understanding of these things so that we can act to insure that we will always have a plentiful supply of water for all living things.

General Objectives:

1. To develop in the child an understanding of physical and chemical properties of water to the extent he may observe such.
2. To implant in the child's mind the uses of water to the extent of its role in sustaining life and soil formation.
3. To help the child understand the concept of the conservation of water to the extent that he becomes conscious of waste, pollution and universal use.
4. To develop in the child the idea of how water can be conserved, mainly through wise management.
5. To develop in the child an awareness of how water may be restored toward its previous quality and quantity to the extent that he is aware of methods restorative conservation.
6. To complement the child's understanding of the nature and importance of water through observations made at the spring site.

UNIT OUTLINE

I. Importance of Water

EVERY DAY WE USE MORE WATER ...

Each of us uses 50 to 100 gallons of water every day. (Before the era of modern machinery we each used 8 gallons a day!)

It takes 115 gallons of water to grow wheat for one loaf of bread.

A large tree drinks up more than 1,000 gallons of water on a hot day.

Like air, water is our most important resource for survival.

In pioneer days, in most of the country, water was 8 to 10 feet below the surface of the land. Now, in the same areas, it is 16 to 20 feet below. (In one western state it is 58 feet below.) In 1950, the Nation's cities and towns used 14 billion gallons of water a day. In 1975, it is estimated 30 to 40 billion gallons will be required daily!

II. Physical & Chemical Properties of Water
   - A. Composition
   - B. Surface Tension (cohesion)
   - C. Specific Heat
   - D. PH
   - E. Density
   - F. Solvent Properties (i.e. necessary for metabolic action)
   - G. Hydrologic Cycle

III. Uses of Water
   - A. Sustaining Animal Life
   - B. Sustaining Plant Life
   - C. Soil Formation & Transportation

IV. Conservation is Not
   - A. Stream Pollution
   - B. Land Erosion
   - C. Excessive Waterplant Growth (hyacinth)
   - D. Industrial Pollution
   - E. Excessive & Unwise Land Burnoff

V. Efforts to Conserve Water
   - A. Water Pollution Act
   - B. State Laws Regarding Pollution
   - C. Local Conservation Practices

VI. Restorative Conservation of Water
   - A. Planting the Proper Types of Vegetation

- B. Watershed Projects
- C. Corrective Legislation

Understandings in Relation to the Site

1. water table
2. recharge - dependent on rainfall
3. types of vegetative areas due to the depth of the water table
4. types of soil due to the depth of the water table
   - a. sterile sand in the high and dry areas
   - b. sand with some humus in the intermediate area
   - c. humus - pure organic - in the low wet areas
5. discharge
   water pressure gradient toward Rocky Creek
6. pollution in Rocky Creek
   - a. sewage affluent
   - b. crab factory affluent
7. sulfur spring
   - a. absorption of CO_2 by raindrops forming carbonic acid
   - b. during percolation sulfur is dissolved forming hydrogen sulfide
   - c. upon reaching the surface the gas is released giving the characteristic odor
   - d. artesian principle explains the spring action

Activities:

1. aquaria - fresh and polluted water
2. stream table
3. hydrologic maps
4. solar stills
5. heavy water
6. biochemical oxygen demand test
7. PH of water
8. balance - rocks and plants and water
9. standpipes on site to show water table level

Summary:

Man's dependance upon water is axiomatic. But whether these needs will be met in the future is the crucial question. The mathematics of the situation are simple: The total freshwater available now in the United States is about 700 billion gallons per day. In the year 2000 we will need 900 billion gallons per day. Efforts to change the present day industry have shown that these changes come about far too slowly. The only answer to man's problem is found in education. If the future industry managers, land developers, and government officials have been taught both the aesthetic and materials benefits of clean water, man's needs will be met.

UNIT ON WILDLIFE

GRADES 7 - 12

Introduction:

This is to briefly introduce the range and introduce the possibilities for using the Outdoor Education Center as a means of teaching about wildlife in this area of Florida.

Objective:

To understand the role of the wildlife in the dynamic equilibrium in each of the following areas of the center and the relationship between areas.

Areas:

1. Long-leaf pine, oak, palmetto - sandy dry area.
2. Cyprus pond area having a fluctuating water level.
3. Oak, hickory hardwood - hammock area.

Specific Objectives:

A. To know the wildlife associated with each of the three habitat areas, and why they are found in each particular area to the extent that animals can be recognized when actually in sight and to seek and recognize wildlife not in sight.

B. To learn the specific adaptations each species of wildlife has developed to maintain existence in its habitat.

C. To know and understand the seasonal effect on wildlife in each area.

D. To understand man's role in the conservation and preservation of wildlife in its natural habitat.

Method of Approach:

The Transit Method:

Step off an area about ten steps on a side in the form of a square for the purpose of identifying plants and animals in the area.

Establish cleared area around the quadrant for identifying animals entering and leaving the area.

Make a record of all animals to be found in the area. This is to include such things as insects, ground squirrel ("salamander") mounds, and hills, land turtle holes, etc.

Observe and record the wildlife in its activities such as an ant hill.

Encourage individualism and the follow-up of observations divergent of the prescribed observations.

Subject each area to the transit method, then study the interrelationship between the wildlife in each area as Mr. Richard Tillis describes in:

"The Balance of Nature", pages XVIII - XX, Life List, Field Studies in Biology, Virginia Langbein.

THE BALANCE OF NATURE

by

C. Richard Tillis

Director of Education, Pine Job Conservation Education Center, West Palm Beach.

HOW DO ANIMALS DEPEND ON PLANTS FOR THEIR LIVES?

Animals require food, water and cover. Plants supply all three.

The kinds and numbers of animals that can live in an area are determined by the kinds and numbers of plants living there.

As plants manufacture their own food they give off oxygen. Without oxygen almost all animals die.

HOW DO PLANTS DEPEND ON ANIMALS FOR THEIR LIVES?

Animals transport seeds to new areas so that more plants can grow. Some seeds pass through the animals' bodies before they are deposited; others simply stick to the fur and fall off later. Without seed transport plants would crowd themselves out of existence.

Insects are animals -- some of which harm plants and some benefit them. Some insects carry pollen from plant to plant, and without them the plants could not reproduce. Some insects eat other insects which are harmful to plants.

Birds are animals that eat insects. They keep the numbers of plant-eating insects down.

HOW DO PLANTS DEPEND ON SOIL?

Soil acts as an anchor to hold plants in place, and supplies them with the water and minerals they need for growth.

HOW DOES SOIL DEPEND ON PLANTS?

Plants reduce erosion, preventing water or wind from washing or blowing soil away.

Some plants, legumes like clover and beans, add nitrogen to the soil. Nitrogen is necessary for soil to be healthy.

Plants enable the soil to hold more water.

Plants, when they die, return their mineral content to the soil.

HOW DO ANIMALS DEPEND ON SOIL FOR THEIR LIVES?

The most important way is that the soil produces plants, and most animals eat either plants or other animals which eat plants.

Many animals use the soil also as shelter, either building a home of mud or making a tunnel in the earth.

Some animals, such as the earthworm, requires a moist skin in order to breathe, and tunneling through the soil supplies the constant moisture that they need.

HOW DOES SOIL DEPEND ON ANIMALS?

Insects eat dead plants and animals and eat waste matter from live ones, converting all this material into forms that fertilize the soil.

Earthworms eat their way through the soil, making small channels for air and water to penetrate.

All burrowing animals churn the soil and aerate it, as we do when we plow.

WHAT IS THE BALANCE OF NATURE?

When we go into one of the beautiful natural areas of Florida, we can see that all the relationships described above are in full effect, undistrubed by man and requiring no attention or care by man. The amount of healthy soil controls the amount of plant life; and the animal life limits the amount of plant life. Also the kinds of plant determine the kinds of animal and the type of terrain determines the plants. Plants and animals enrich the soil during their lives and after their death. This natural condition is called the "balance of nature". It is not the steady bahnce of two children on a seesaw, but rather a constant change.

Animals are continually being born and dying; plants are germinating and decaying, soil is being formed anew and is being washed away by water and wind. This changing kind of balance is called "dynamic equilibrium".

In the balance of nature there are controls which prevent one kind of plant or animal from producing population explosion. If we interfere with these controls, one kind of plant or animal may reproduce to the point of wiping out all or most others. Biologists call this condition "pollution". When we pour waste materials into a river we change the water into habitat suitable only for a few kinds of plats and animals, and these kinds are all too often harmful to ourselves.

Predation, the eating of one animal by another, is perhaps the most important of these controls that maintain the balance of nature. In our cities, where the hawks, owls, and snakes who normally feed on rats are not present, rats multiply so as to become a major problem, whereas in any wild area their numbers are automatically held down by these predators.

Other controls are the relative abundance of the particular requirements of each life form; air, water, minerals, space, sunlight, heat -- in short, the abiotic parts of the environment.

Man is a special kind of animal for he can choose to destroy or create habitats where plants, animals, or soil can exist. Unfortunately, he often destroys or creates habitats without considering the long-range effects of his actions. Sometimes he creates an environment in which the only creatures able to survive are those that he emphatically does not want. He calls the plants "weeds" and the animals "pests", and he spends millions of dollars on weed killers and pesticides. These chemicals often injure or kill the animals that he does not want to kill, including himself.

What we should do is to apply the understanding of nature which has been given to us by the ecologists, and manage our environment in accordance with these precepts. When we do we shall harvest a sustained yield of our natural resources, and provide our descendants the natural resources necessary for their own productive and healthy lives.

Balance in nature:

A. The result of these dependencies or inter-relationships between plants, animals, soil and the non-living environment is the balance of nature.

B. This balance is a dynamic equilibrium. The simplest way we could think of to explain dynamic equilibrium to children is as follows:

    (1). Define equilibrium as unchanging: ex. jar of water - level remains the same - it is in a static or unchanging equilibrium.

    (2). Help them think of, or show them a situation like a kitchen sink without the stopper in it and with the water from the tap running just fast enough to keep the level unchanging (in equilibrium). Here the materials are changing but the level remains the same. This is a dynamic (changing) equilibrium.

Of course, relate this to animal and plant life. Example: woodpeckers constantly being born, flying into West Palm Beach area, dying and flying out of West Palm Beach; yet the number of woodpeckers (the population) remains approximately the same. This is another area where you can go as far as the children's (and your) interest permits. Example: Use analogy man stops sink with hand. What happens to amount of water? Man stops normal predators of woodpeckers, what happens to number of birds -- increase water from tap - increase bird population -- then from here lead children into some possible effects of increase or decrease of the number of woodpeckers or any kind of animal.

C. There are, however, natural controls, which prevent one kind of plant or animal from increasing its numbers until it prevents the others in a community from living. If these controls are interfered with then pollution results.

One of the most important of these controls is predation.

A. Animals that use other animals for food are called predators. Examples: Hawks, foxes, owls, weasels, snakes feed on mice, rats and other potentially harmful animals. Since these harmful animals reproduce at great speed these predators are necessary to control their numbers.

B. Birds and insects.

Other biological controls:

The screw worm fly is bluish green in color and about three times the size of a house fly. It lays its eggs on the edges of wounds on cattle. After a few days the eggs hatch forming a worm-like larva about one inch long and about as thick as a small pencil. This larva bores through the flesh of the animal, eating the meat as it moves. Infections have been observed so severe that the worms eat out the whole shoulder of an animal. You can see then that screw worm fly infections ruin the cattle business, raise the price of beef and milk, and in this sense steal the food from our mouths.

Beginning in 1954 experiments were carried out by scientists from Florida, Georgia and Alabama, in an attempt to use atomic radiation to control this pest. After years of experimenting it was discovered that the atomic radiation from radioactive cobalt 60 could be used to sterilize the eggs of screw worm flies. Biologists and physicists then began to raise the flies in universities, gather millions of their eggs, expose them to cobalt 70 and hatch the eggs. This produced screw worm flies both male and female which upon mating with normal flies produced eggs which did not hatch. This assistance by the biologists and physicist team coupled with the normal predators who eat the eggs of the fly, such as beetles and ants had resulted in the virtual elimination of this pest in the United States. This is a fine example of a beneficial use of atomic energy for it has led in this case to control of a serious animal disease. But we must remember that without the biologists knowledge of the life cycle and reproduction of this species of insect the control could never have been established.

A Partial List of Life Found in the Areas:

Plants --

Bamboo Briar
Wax Myrtle
Gall Berry
Broom Sage
Blackberry
Long Leaf Pine
Oak Species
Huckleberry Family
Stagger Bush
Cypress
Bay Tree
Raindeer Moss
Fetter Bush
Button Bush
Smart Weed
Arrowhead
Palmetto
Sabal Palm
Hawthorne
Sparkle Berry
Sweet Gum
Wild Honeysuckle
Vibernum
Hickory
Raytan
Grapevine
Ash

Animals --

Towhee
Robin
Ruby Eyed Kinglet
Buzzard
Sparrows
Deer
Rabbit
Cat Squirrel
Wood Ducks
Blue Jay
Cardinal
Mockingbird
Ruby Crowned Ringler
House Wren (Winter)
Downy Woodpecker
Moccasins
Red Bellied Mud Snakes
Green Water Snakes
Eel
Barred Owl
Tlicker
Myrtle Warbler
Raccoon
Marsh Rabbit
Woodpecker
Rat
Wild Hog
White Throated Sparrow
Blue Jay
Carolina Wren

Birds which should be seen in the Outdoor Education Center. All of the following were actually seen during a single field trip through the center:

Common Name	Ab	WF	Hab	Diet	Common Name	Ab	WF	Hab	Diet
Turkey Vulture	C	PR	5	C	Catbird	C	PR	2	I,B
Black Vulture	C	PR	5	C	Brown Thrasher	C	PR	1,2	I,B
Red Shouldered H.	C	PR	1,3,5	I,R,M	Robin	C	WR	1,2,3	B,S
Bobwhite	C	PR	1,2,3	B,S	Hermit Thrush	U	SFM	1,2	B,S
Mourning Dove	C	PR	1,3	S,B	Eastern Bluebird	R		1	B,S,I
Ylw-Shft. Flicker	C	PR	1	I	Ruby-Cr. Kinglet	C	WR	1,2	Fi,I
Red-Bellied Woodp.	C	PR	1	I	Cedar Waxwing	U	SFM	2,5	B
Eastern Phoebe	C	WR	1,2,3	Fi	Black & White Warbl.	C	SFM	1,2	I
Tree Swallow	C	WR	5	Fi	Meadowlark	U	PR	3	I,S
Blue Jay	C	PR	1	S,B,I,A	Redwing	C	PR	4,5	S,I
House Wren	C	WR	1,2	I	Cardinal	C	PR	1,2,3,4	S,B,I
Carolina Wren	C	PR	1,2	I	Am. Goldfinch	C	WR	1,2,5	S
Mockingbird	C	PR	1,2,3	Fi,I	Rufous-sided Towhee	C	PR	1,2	I,S

See explanation of symbols on next page.

POOR ORIGINAL COPY - BEST AVAILABLE AT TIME FILMED

Abundance at Outdoor Education Center (AB)

C	Common
U	Uncommon
R	Rare

When Found (WF)

PR	Permanent resident
WR	Winter resident
SR	Summer resident
SFM	Spring and fall migrants

Habitat (Hab)

1	Pine woodland
2	Gallberry and palmetto thickets
3	Fields
4	Canals and marsh areas
5	Overhead

Diet

I	Insects: grasshopper, beetles, grubs, etc.
Fi	Flying insects: mosquitos, flies, moths, etc.
S	Seeds
B	Berries
M	Small mammals: mice, rats, young rabbits, etc.
F	Fish, minnows, mollusks, crustaceans, aquatic life
R	Reptiles: snakes and lizards
A	Amphibians: frogs and toads
C	Carrion

SUMMARY OF CONSERVATION

To summarize the relationship of man to conservation we must consider the wide sweep of the environment and the forces which mold human incentives and behavior. Then we must emphasize teamwork and the delicate balance between the forces that keep life functioning. We must constantly be aware of the progression of life. Finally, we must realize that it is possible to use the life-supporting natural resources without destroying them.

References:

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Teale, E. W., The Insect World of J. Henri Fabre. New York, Dodd, Mead & Co., 1949.

Woodbury, Angus M., Principles of General Ecology. Toronto, Blakiston Co., 1953.

Storer, John H., The Web of Life. New York, The New American Library, Inc., 1956.

UNIT ON SOIL

GRADES 10 - 12

Introduction:

A house, it is often said, does not become a home until it has been lived in. Neither does the surface of the earth become soil until it too has been lived in by long generations of plants and animals. We know that soil is necessary for good plant growth. It may surprise many to know that good plant growth is necessary for soil.

The first simple plants which moved from water to land were able to survive on a raw mineral surface which they altered physically, chemically, and upon death added their remains to those minerals thereby changing them, enriching them, and giving rise to new life forms.

The broader concepts around which this unit is structured seek:

I. to promote an understanding of the processes involved in the formation of soil.

II. to motivate students toward development of concepts governing the interrelationship between plants, animals, soil, water and air.

III. to involve students in meaningful activities and investigations which promote appreciation for soil conservation practices and management through field trips and utilization of facilities of the Resource - Use Outdoor Education Center.

We hope to accomplish the foregoing through specific objectives designed:

I. to aid the student in developing a definition for soil by understanding:

  A. The physical character of soil

    1. large pebbles, stones, dead twigs, roots, leaves, etc.
    2. coarse sand

3. fine sand
4. silt (resembling flour)
5. groups of soil particles forming aggregates

B. The chemical-organic character of soil

1. silica
2. alumina
3. iron
4. potash
5. calcium
6. magnesium
7. phosphate
8. nitrogen
9. plant roots
10. bacteria
11. actinomycetes
12. earth worms
13. fungi
14. algae
15. nematodes
16. others

II. to assist the student in broadening his understanding of soil types and structure

A. The layers of soil

1. topsoil characteristics
2. subsoil characteristics

B. Soil type characteristics

1. sandy
2. clay
3. loam

III. to guide the student toward comprehension of the soil-making process and its relation to:

A. Parent material - bedrock

1. sandstone and character of end product
2. shale " " " " "
3. limestone " " " " "
4. granite " " " " "

B. Climate controls

1. dissolution by rainwater
2. effects produced by differences in day and night temperatures
3. effects produced by seasonal changes

C. Effects produced by simple life forms such as:

1. lichens
2. mosses

    3. bacteria
    4. fungi

  D. Topography - determine by tilt of rocks

    1. rate of water drainage
    2. growth rate of plants
    3. amount of organic matter for subsequent plant generations

  E. The time involved in soil-making

    1. 30 years - young soil
    2. 50 years - mature soil
    3. 20,000 years - wind blown loss material

IV. To lead the student toward insights from which he conceptualized the total interdependence of all things in the environment through an understanding of:

  A. Photosynthesis

    1. soil
    2. water
    3. minerals
    4. solar energy
    5. air (O_2, CO_2, N_2)

  B. The food chain

    1. micro and microscopic plants feed smaller animals
    2. larger animals feed upon smaller animals, etc.
    3. plants as the source of food for earth-life

  C. The carbondioxide cycle

    1. animal producers
    2. plant consumers

  D. The oxygen cycle

    1. plant producers
    2. animal consumers

  E. The water cycle

    1. necessary for all life
    2. soil producer

  F. Solar energy

1. source of life
2. the source of energy for most processes on earth

THINGS TO USE

I. Films and filmstrips
II. Transparencies (ready-made)
III. Soil specialists
IV. Soil-type models
V. Soil testing kits

SUGGESTED FILMS

I. What is soil?
II. How is soil made?
III. How do soils differ?
IV. What lives in soil?
V. Control and conservation of soil

SUGGESTED ACTIVITIES

I. Make some soil artificially.
II. Compare soils by growing plants in them.
III. Prepare a project on how crop cover affects soil loss.
IV. Make a splash board to study splash erosion.
V. Plan a trip to the Resource - Use Outdoor Education Center to study soil in the Ecosystem of various sub-habitats there.
VI. Prepare a conservation corner on the school grounds.

SUMMARY

Most of the loss of eroded land is due to man's mistakes and carelessness. He has cut timbers from slopes allowing the soil to be washed away, burned meadows either on purpose or by accident thereby, killing organic life in the topsoil. He has allowed ground cover of pastures to be over grazed, plowed fields straight up and down instead of across slopes, all of which has set the stage for erosion.

The cure for all this waste of natural resource is being sought through soil conservation service and outdoor education programs through which it is hoped that present and future generations of mankind will be educated to an appreciation of soil conservation and its role in assisting nature to achieve that dynamic balance it strives for in the Ecosystem.

UNIT ON FORESTRY

GRADES 10 - 12

Introduction:

This forestry unit is intended to teach the students that forests are critical to human wellbeing; that their products and functions are necessary for a continued balance in nature and by using outdoor laboratories to extend the aesthetic appreciation and practical use and conservation of forest resources.

General Objectives:
1. To become familiar with an understand uses of native trees.
2. To learn methods of replacement, natural and artificial.
3. To learn methods of determining tree population and monetary value.
4. To become familiar with economic and social values of trees.

I. Dendrology

A. List of native trees which we considered to be most important.

1. Pines
    a. long leaf yellow
    b. slash
    c. loblolly
    d. sand
    e. pond

2. Oak
    a. water
    b. live
    c. turkey
    d. red
    e. white

3. Magnolia

4. Gums
    a. red
    b. black
    c. bay

5. Dogwood

6. Persimmon
7. Redbud
8. Maple
9. Holly
10. Pecan
11. Sabal Palm

B. Procedure for Identification:

1. Identification characteristics
2. Growth habits
3. Habitat
4. Reproduction
5. Products

References:

Florida Forest Service. Forest Trees of Florida, ninth edition.

West and Arnold. The Native Trees of Florida, University of Florida Press, Gainesville, Florida, 1956.

II. Methods of Replacement

A. Seed

B. Native habitat
selectivity

C. Planting methods

1. hand
2. mechanical

D. Protection

1. fire (ground, crown)
2. disease
3. insects
4. animals

References:

Daubenmire, R. F., Plants and Environment, New York: John Wiley and Sons, 1959.

Forestry for Future Farmers Handbook.

III. Methods of Measurement

A. Use of instruments

   1. scale sticks
   2. compass
   3. clinometer
   4. increment borer
   5. chains (66')
   6. log scaling (Doyle, International, Scribner)

B. Counting

   1. restricted plot
   2. entire area

IV. Importance

A. Economic values

   1. Producers
      a. harvesting methods
         1. mechanical
         2. hand
      b. types
         1. selective
         2. clear cut
         3. thinning
      c. phases
         1. felling
         2. limbing
         3. skid
         4. bucking
         5. load
         6. haul
         7. unload

   2. Buyer
      a. products
         1. primary
            a. building materials
            b. cellulose
            c. distillation products
         2. secondary
            a. mulches
            b. weaving
            c. furniture
            d. fertilizers

   3. Remanufacture
      a. tire cord
      b. plastics
      c. fibers
      d. gunpowders

B. Aesthetic Value

1. scenery
2. recreation
3. water conservation
4. climatic conditions
5. atmospheric renewal

V. Methods or Procedure

A. Classroom preparation

1. textbooks
2. library
3. films
4. resource people

B. Beyond the classroom

1. school site
2. local forestry plots
3. Resource - Use Outdoor Education Center

C. Classroom followup

1. evaluation

References:

A. Publications

1. Florida Forest Service (films, books, pamphlets)
2. Resource - Use Outdoor Education Center Library
3. U. S. Department of Agriculture
4. Soil Conservation Service

B. Professional Services

1. State Forest Services
2. Industry Foresters

Addendum:

Outline on interdependency

1. Animals depend on plants:

A. They require food, water and cover; plants supply all of these.
B. The types of animals which live in an area are determined by the types of plants.

C. The quantity of plant life determines the quantity of animal life which can live in an area.
D. In their food manufacturing process (photosynthesis) plants release oxygen which is necessary for most animals to live. (If metazoan, then all.)

2. Plants depend on animals:

A. Animals transport plant seeds to new areas.
  (1) Some stick to animals fur and fall off later.
  (2) Some pass through the animal's body and are deposited later and still grow.
  (3) Many birds eat insects which harm plants: ex. woodpecker eating insects from tree bark.
  (4) Insects carry pollen from plant to plant and allow reproduction. Without this plants could not reproduce, plant eating animals could not live, and all life would cease.

3. Plants depend on soil:

A. Minerals
B. Water
C. Anchorage (support)
D. Soil is a living community, rock particles, microscopic animals, fungi.

4. Soils are improved by plants:

A. Reduce erosion.
B. Legumes add nitrogen to soil.
C. Plants decay upon death and return vital minerals to the soil.
D. Plants increase the water holding ability of soils.

5. Animals depend on soil:

A. Food, shelter, moisture for some.
B. Mud used to line birds nests, build homes, etc.
C. Soils are necessary for plant growth - without plants, plant-eating animals could not live - without these the animals which eat them could not live, so all animal life depends on the soil including man.

6. Soils are improved by animals:

A. Insects eat organic wastes changing them into more usable materials which fertilize the soil.
B. Earthworms eat their way through soils thereby moistening, churning and providing small tunnels which

aerate the soil just as man does when he plows it.

7. Man is a special animal who can move by will to destroy or create habitats and control whether plants, animals, or soil can live in an area.

SUMMARY:

The forest today has become vital to the well being of humanity. We have come to realize that man through conservation can assist in maintaining a balance of nature. "Conservation is as necessary as air, right as rain, real as rock."

OUTDOOR EDUCATION LESSON PLAN
FOREST ECOLOGY

School: Date:

Town: Location:

Grade Level: Time Length:

Classroom Teacher: Number in Group:

Outdoor Teacher:

Objectives:
General
1. To explore a woodland area and by so doing gain a better understanding of the interrelationship of plants and animals.

Specific Objectives:
Group Projects
1. To locate at least five woodland mammals or evidences thereof, and to make at least one plaster impression of an animal track.
2. To locate at least five kinds of plants and to make a soil profile of where plants are found by means of an auger.
3. To locate at least five kinds of insects and chart characteristics of each on a profile card.
4. To locate or find evidences of five kinds of birds and to chart characteristics of each on a profile card.

Concepts:
1. Plants get water from the soil.
2. Plants and animals cannot live without water.
3. Birds are dependent upon plants and insects for food.
4. Plants are dependent upon the soil for food and upon birds, winds, and insects for reproduction.
5. Mammals are dependent upon plants and other animals for food.
6. Insects are dependent upon plants and smaller animals for food.
7. Some birds live primarily in treetops; others live in other strata.
8. Birds and animals use trees and stumps for homes.
9. Each level of the forest supports various life, ie. Above, below, and at ground level.

Vocabulary:

1. Climax - A community at a relatively stable condition which is able to reproduce itself indefinitely under existing conditions. The succession leading to a climax represents the process of adjustment to the conditions of stress and the climax represents a condition of relative equilibrium.
2. Competition - The general struggle for existence in which the living organisms compete for a limited supply of the necessities of life.
3. Ecosystem - The cycling exchanges of material and of energy between living things and their environment.
4. Environment - The sum total or the resultant of all of the external conditions which act upon an organism.
5. Food chain - A figure of speech for the dependence for food of organisms upon others in a series beginning with plants or scavenging organisms and ending with the largest carnivores.
6. Food Web - All the interconnecting food chains in a community.
7. Predator - An organism which preys upon other forms and eats them.
8. Prey - An animal that is attacked and killed by another for food.

Procedure:

1. Introduction
2. Brief defination of terms
3. Division of class into four groups with five members each
4. Explain proper use of equipment to respective groups
5. Collection of data by groups
6. Gathering of groups and discussion period
7. Evaluation

Materials:

1. Binoculars
2. Field books
3. Flash instructional cards
4. Hand lenses
5. Clip boards
6. Pencils
7. Paper
8. Soil auger
9. Cardboard for graphing profile of soil
10. Bird profile chart
11. Insect profile chart
12. Plaster of paris
13. Glue

Questions:

1. What is the predominant tree type in this woods?
2. What conditions have enabled this sort of forest to grow in this particular locality?
3. How has the forest affected the land upon which it grows?
4. Does the amount of shade cast by the trees have an affect upon the life and environment below the tree?
5. How does plant life support animal life?
6. Give an example of a food chain.
7. Can animals be preditors and prey also?
8. How can one determine whether a forest is a healthy one?
9. Is this forest a healthy one?
10. Do most animals live in the center of the woods?

Resources:

1. Benton, Allen A. and Werner, William E., Field Biology and Ecology, (New York; McGraw-Hill, 1966.)
2. Dice, Lee R., Natural Communities, (Ann Arbor University of Michigan Press, 1962).
3. Nickelsburg, Janet, Field Trips: Ecology of Youth Leaders, (Minneapolis: Burgess Publishing Company, 1966).
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OUTDOOR EDUCATION LESSON PLAN

School:
Grade Level:
Classroom Teacher:
Topic: Trees and Plants

Date:
Location:
Time Length: Approx. 45 minutes
Number in Group:

Objectives: To show how trees differ.
To see how trees effect our lives.
To understand the plant kingdom and how it grows.

Concepts: All trees are not alike.
Trees and plants play an important part in our life.
Trees and plants need certain things in order to grow.

Vocabulary: Biltmore stick board feet conifers bud scars
tap roots cambium sapwood heartwood annual rings
broad-leaved compound photosynthesis pistil
stigma ovary pollen glucose hard and soft wood
grain of wood

Instructional Procedure and Activities:

In classroom: Explain the tree charts and clue sheets; show how to use ; show how to use tree guide; explain Biltmore stick. Divide into smaller groups.

Outside: Each group take a tree. As a group, fill out charts. Look at wood slabs; look at - discuss small plants. If leaves are out, take some back for azalid prints and to make flash cards and games. Pick a few plants to press.

Materials:
for
Before Outdoor Experience - pictures, collections, discussion of terms

Experience itself - Biltmore sticks, charts, clue charts, books, wood slabs, plant press, clip boards

After Experiences - Ditto sheets for common trees, materials for ozalid prints, plant press, directions for tree games and flash cards.

OUTDOOR EDUCATION LESSON PLAN

School:
Grade Level:
Classroom Teacher:
Topic: Signs of Fall

Date:
Location:
Time Length:
Number in Groups:

Objectives:
To create an understanding of how nature gets ready for winter.

Concepts:
Seeds are everywhere.
Leaves will change their color.
Insects and animals get ready for winter.

Vocabulary:
hibernate depend food change ripe adapt
seasonal change

Instructional Procedure and Activities:
Discuss why nature has to change.
Explore using lens.
Gather seeds and leaves.
Explore under rocks and logs.
Make ozalid prints.

Materials:
for
Before Outdoor Experience - pictures and charts

Experience itself - lenses and ozalid paper

After Experience - mount for seeds
ditto sheets

OUTDOOR EDUCATION LESSON PLAN

School:	Date:
Grade Level:	Location:
Classroom Teacher:	Time Length: 45 minutes
Topic: Rocks, Soil and Minerals	Number in Group:

Objectives: To show the composition of soil and how rocks contribute to its making.
To help the children understand how to identify rocks and minerals.
That rocks are a mixture of minerals.

Concepts: Non-living things of the earth are minerals. Soil is made up of many things. Different kinds of rocks are formed in different ways. Rocks break down into soil. Such forces as wind, water, and weather wear rocks away.

Vocabulary:
crystal igneous sedimentary metamorphic cleveage talc
calcite quartz feldspar shale state

Instructional Procedure and Activities:

In Classroom - Discuss kinds or rocks - Pass around rocks and have children look with hand lens. Discuss identifying rocks and minerals. 25 min.

Outside - Each child take a piece of paper - find two rocks - rub together to make soil - look at with hand lens - take sample of soil - test it - take temperature underground and on top.

Materials:
Before Outdoor Experience - samples brought in by children.
Experience Itself - hand lens - rocks and minerals, charts, rock hammer, soil testing equipment
After Experience - clue sheet (ditto) Identify clue sheet (mimeo) Experiment ideas.

OUTDOOR EDUCATION LESSON PLAN

School:
Grade Level:
Classroom Teacher:
Topic: Insects

Date:
Location:
Time Length:
Number in Group:

Objectives:
To show that insects are different
To create an understanding that insects can be both helpful and harmful

Concepts:
All insects are not alike.
Insects can be both helpful and harmful

Vocabulary:
Thorax antenna abdomen pupa nymphs cocoon
compound eye spiracle tracheae lavude maggot
metamorphoses

Instructional Procedure and Activities:
Inside - Use charts to discuss types of insects.
How they are helpful and harmful.
Outside -Collect insects.
Look at them with hand lens.

Materials:
for
Before Outdoor Experience - charts, pictures
Experience itself - nets, killing jars, cages, lenses
After Experience - Ditto sheets, mounts, liquid plastic to embed, cage, drying material.

OUTDOOR EDUCATION LESSON PLAN

Topic: WEATHER

Time Length: 45 Minutes

School:

Location:

Classroom Teacher:

Date:

Number in Group:

Grade Level:

Objectives: To help the children understand how the movement of air affects the weather. To help the children see how weather instruments can forecast the weather.

Concepts: Wind is moving air. Wind brings changes in the weather. Differences in air pressure cause the air to move. The weight of the atmosphere presses on the earth. Air pressure decreases with an increase in altitude. Precipitation is water that falls as rain, snow, hail, sleet or dew.

Instruments that show temperature, air pressure and wind help to forecast weather changes.

Vocabulary: (1) air pressure, (2) barometer, (3) atmosphere, (4) precipitation, (5) anemometer

Instructional Procedure and Activities:

Inside - Use weather map to show weather front moves; talk about instruments

Outside - Take instruments out and set up; show how measurements are made; show how colors affect temperature; discuss clouds

Materials:

for

(a) Before Outdoor Experience - discussion of vocabulary

(b) Experience - weather map and instruments, color boxes, charts

(c) Follow-up Study - ditto weather forecast sheet (duplicated for each child); Beauford wind scale (to be duplicated), materials and directions for making wet and dry thermometers, weather pictures or charts, instruments (if needed)

OUTDOOR EDUCATION LESSON PLAN

School:
Grade Level:
Classroom Teacher:
Topic: Map and Compass

Date:
Location:
Time Length:
Number in Group:

Objectives: To help children understand the use of the topographic map. To help children understand the use of a simple compass.
Concepts: Contour lines show shape and size.
A compass shows direction in degrees.
Map symbols show many things.
Vocabulary: contour topographic degree magnetic north symbol

Instructional Procedure and Activities: 25 minutes inside classroom using a topographic map. Each child will have a small practice map and then a large one to use. Contour mapping models will be used to show how a contour is build. Outside, each child will have a compass to use to find directions and degree readings.

Materials:
- Before Outdoor Experience:
  - show types of maps
- Experience Itself:
  - maps, contour models, compasses, topographical maps
- After Experience:
  - ditto sheet of topographical map, ditto sheet with direction game.

OUTDOOR EDUCATION LESSON PLAN

School:	Date:
Grade Level:	Location:
Classroom Teacher:	Time Length:
Topic: ANIMALS	Number in Group:

Objectives:
- (1) To show how animals differ from one another
- (2) To show how parts of the bodies of birds and animals help them in their life
- (3) To show how animals can live

Concepts:
- (1) All animals are not alike.
- (2) Some animals sleep throughout the winter.
- (3) An animal can be told from his tracks.
- (4) Animals adapt to their surroundings.

Vocabulary:
- (1) tracks
- (2) adapt
- (3) pad (of animal foot)
- (4) claw
- (5) hook
- (6) mammal
- (7) hoof
- (8) rodent
- (9) teeth

Instructional Procedure and Activities:

Inside - Show pictures. Discuss kinds of mammals. Why are they called mammals? Discuss - how teeth differ? where they live? why? Why some sleep in winter?

Outside - Try to find places where animals might live on the school site. Is there any trace of them?

Materials:
- for
- Before Outdoor Experience:
  - pictures - discussion
- Experience Itself:
  - pictures - charts
- After Experience:
  - ditto sheets - book

OUTDOOR EDUCATION LESSON PLAN

School:	Date:
Grade Level:	Location:
Classroom Teacher:	Time Length: 45 minutes
Topic: NATURE CRAFTS	Number in Group:

Objectives: To show that many things can be made from natural materials.

Concepts: Nature is a storehouse for our use. Observation will help you to find many treasures.

Vocabulary: ozalid print, draw knife

Instructional Procedure and Activities: The group will go outside and explore---looking for material that can be used (rocks, wood, material for prints). After returning to classroom, the group will make ozalid prints (if no sun material will be left for the class to do), suggestions and ideas made for use of materials gathered.

Materials For:

Before Outdoor Experience:	discuss ideas with children
Experience Itself:	glue, saw, draw knife, sandpaper, ozalid paper, jewelry findings, liquid plastic
After Experience:	materials left for group to use, depending on materials found

OUTDOOR EDUCATION LESSON PLAN

School:	Date:
Grade Level:	Location:
Classroom Teacher:	Time Length: 1 hour
Topic: BIRDS	Number in Group

Objectives: To show how birds differ and why.
To show how birds live in our area.
Concepts: All birds are not alike.
How a bird is made depends on what he eats and where he lives.
Vocabulary: plumage down molt beak migrant

Instructional Procedure and Activities: Show charts and models on birds - What to look for - How to observe birds. Give out clue charts inside classroom. Outside: Use birds, slides. Check all possible area on school ground for birds and possible bird areas.

Materials:
for
Before Outdoor Experience: books on birds, pictures
Experience Itself: clue sheets, guides, charts, binoculars, models
After Experience: ditto material on main birds, pictures, class projects.

OUTDOOR EDUCATION LESSON PLAN

School:
Grade Level:
Classroom Teacher:
Topic: EXPLORING

Date:
Location:
Time Length:
Number in Group:

Objectives:
- (1) To show children that many things exist all around them
- (2) To see how man has used stone and wood for his use
- (3) To find evidence of plant growth and life everywhere

Concepts:
- (1) Some woods are more useful than others.
- (2) Stone can be used in many ways.
- (3) Exploring a telephone pole can show you many things.
- (4) Plants can grow almost anywhere.

Vocabulary:
- (1) transformer
- (2) grounded wire
- (3) granite
- (4) soft wood
- (5) creosote
- (6) fuse

Instructional Procedure and Activities:

Outside - Look around the school grounds and find interesting things (each child has hand lens). Look at a telephone pole and discuss the kind of wood, wires and uses. What other things are on a pole? Find uses of stone and rock. Try to see where weeds and plants have come between cracks. Why has this happened? What effect does weather have on man-made things?

Materials:
for
Before Outdoor Experience

Experience Itself - hand lens
After Experience

OUTDOOR EDUCATION LESSON PLAN

School:	Date:
Grade Level:	Location:
Classroom Teacher:	Time Length:
Topic: INDIANS	Number in Group

Objectives: To show that Indians differ because of environment.
To show how Indians used what was around them.
Concepts: All Indians are not alike.
The Indians used natural materials in all that they did.
Vocabulary: mask Woodland Plains design wigwam long house dugout

Instructional Procedure and Activities: Inside - Discussion of the five types of Indians. Pass around Indian articles. Talk about each one. Outside - Play three Indian Games - Hoop and Stick - Ring Toss and Pictures.

Materials:
for
Before Outdoor Experience - Pictures and readings about Indians
Experience Itself - Indian articles; equipment for games
After Experience - Books, ditto sheets on Indians, equipment to make Indian games.

TREE CLUE CHART

Resource-Use Outdoor Education Center

Perry, Florida

Date ______________________________

Name	
Shape	
Leaves	
Buds	
Bark	
Flowers	
Fruit	
Other Characteristics	

PLANT - ANIMAL COMMUNITIES

By Beth Schultz
Department of Biology, Western Michigan University

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Have you ever asked a fisherman where to catch fish? Almost every fisherman will give you a different answer, but each will lead you to some spot where plants are growing in the water. Why are there more fish where plants grow? Perhaps the fish are finding food or hiding places. If they are finding food amoung the plants, what is the food? If the food is smaller fish, tadpoles, or insects, these animals too, must live amoung the plants and find food.

Ask a hunter where he goes to find deer. He will tell you that deer live in young forests where leaves and buds of trees are low enough for browsings. Ask a bird watcher to look for different kinds of birds. He points to hedgerows for catbirds, abandoned fields for song sparrows, tall trees for orioles, and marshes for red-winged blackbirds.

The fisherman, the hunter, and the birdwatcher, whether they realize it or not, describe the habitats of animals in terms of the kinds of plants that are found there and, perhaps, the amount of water. These plants with animals living amount them are plant-animal communities. The plants and animals depend on one another. Each kind of plant and animal gives something to the group and get something from the group. Each kind of animal finds food, protection, and way to reproduce. The animals are not conscious of this cooperation (and competition). They live in association because of their particular needs and their abilities to tolerate the conditions of the habitat. They live as they do because they cannot live otherwise.

Many kinds of plant-animal communities exist, some on land, and some in water. Naturalists usually name these communities for the largest or most plentiful kind of food found there, because these dominant plants indicate and help to determine the conditions of light, water, and other environmental factors. Sometimes community names describe the moisture conditions also. A few well-known communities are named thus: sand prarie, dry oak woods, sphagnum bog, cat-tail marsh.

All plant-animal communities differ from one another. The bottom of a pond on which water plants grow gets more sunlight then the bottom of a pond. In the darker habitat is another kind of dragonfly nymph which climbs amoung the roots of the floating plants.

In a plant-animal community, such as a pond, there are different kinds of places where animals live. Some animals such as worms, water sow bugs and beetle larvae, burrow into mud or sand or into the bodies of plants. Animals such as adult dragonflies and spiders fly or crawl around the tops of plants above the water surface where there is more light. Other animals remain hidden in dark crannies amount the roots and branches. The number of animals and the number of different kinds of animals in a community depend, to a large extent, on the number and kinds of plants.

All plant-animal communities have some characteristics in common. Certain types of food relationships, for example, exist in all communities, although the kind of plant or animal which occupies a specific niche will differ from one community to another.

Green plants play a key role. They furnish the animals with food, some oxygen, and places to live. While the sun shines, the green plants make sugar from water and carbon dioxide. Then the plants use this sugar and minerals from the soil to make other substances they need. While manufacturing sugar, the plants release oxygen into the water or air. Some of the animals in the community eat the plants, and other animals eat the plant-eaters. All the animals give off waste materials and carbon dioxide, which go into the soil and water or air and nourish the plants. All the animals take in oxygen from the water and air. Thus do the plants and animals depend on one another.

As the plants change from one season to another, the animal life associated with them changes, too. If leaves and stems die and crumble during cold weather, the animals which eat green leaves will have no food. What happens to these animals? Some dig into the soil or into crevices in dead or dormant plants and hibernate. Others migrate. Still others lay eggs, assuring the next season's generation, then die. Some birds and mammals remain active through the winter, feeding on fruits and seeds.

You will best understand these relationships if you undertake your own study of a biotic community during a period of a few weeks or months. As you study a community, you will find out how the animals within it survive cold or dry seasons when there is little food for them. Nearly everyone can find a pond, stream, field border or woods near home. If you live in a large town or city, your plant-animal community may be a small one: a park, a corner of a back yard, an empty lot, or just one tree in a lawn or school ground. Wherever there are plants, there are almost certain to be animals. As you explore and observe, you should keep records of the things you find. Perhaps you can take a few of the plants and animals into the classroom, and keep them in a terraria or aquaria, and observe them more closely.

The fact that communities have characteristics in common makes it possible for you to organize an investigation of any community, even one which you have never explored before. You will look for the food producers, the plants which produce food by photosynthesis. Then you will look for the plant-eaters. You will look for a variety of riches where animals can make a living.

Because each community is different, you will find many shapes and textures of plants. You will find many kinds of plant-eaters and a variety of animals which prey upon the plant-eaters. You may discover remarkable adaptations for getting food and oxygen, for reproducing, for survival over unfavorable seasons. You can observe how plants and animals react to changes of temperature, light, and available water. These are thousands of different kinds of plants and animals. Each kind possesses a combination of structures and ways of functioning which compel it to live within definite environmental conditions. There is no end to the discoveries you can make.

QUESTIONS TO GUIDE YOUR COMMUNITY STUDY

I. What is the Habitat Like?

1. What types of plants are found here? (trees, shrubs, grasses, etc.)
2. Which kind of plant seems to be dominant?
3. How wet is the habitat? The amount of water can be described from the extreme of standing or flowing water to desert conditions.
4. How light is the habitat? Are some parts of it lighter than others?

II. What animals are in the community? Where do they live?

1. What places in and around the plants offer living quarters for animals?
2. How are these places alike? How are they different? (consider light, water, temperature)
3. What animals do you find in each of the places?
4. Which place has most animals?
5. Which place has most different kinds of animals?
6. What comes into the community from outside?

III. What are the habits of each community member?

1. What does each of the animals eat?
2. How do the animals get their food?
3. How do the animals move from place to place?
4. How do the animals take in oxygen and give off carbon dioxide? (lungs, gills, skin, etc.)
5. How do the animals change as they grow?

IV. How does the community change?

1. In what ways do the parts of the community change as the seasons change?
2. Do you find the same kinds of plants and animals and as many of them in various parts of the community or in fall, winter, and spring?
3. If you find them different, in what ways are they different? Can you find reasons or advantages for the changes you observe?
4. Communities change from year to year. Question the people who live nearby. Try to find out what your plant-animal community was like three, five, and ten years ago.

VISITING A FIELD

From Living Things, National Science Ass't.

Guide Sheet - Animal Group

Materials needed:

Camera
Forceps or tweezers for handling small specimens
Plaster of paris and a canteen of water for making casts
Spoons and a shovel for digging
Tin cans for catching specimens
Gallon jars with punched lids for housing specimens
Cheesecloth for covering jars
Grease pencils for labeling bottles
70% ethyl alcohol for preserving jars
Rubber bands, cotton, cork disk, carbon tetrachloride (Caution. Be careful of noxious fumes.) for killing jars
Hand Lenses
Nets for catching flying insects and other animals
Scissors for clipping plants
Old Sheet
Chloroform (Caution. Poisonous and explosive, should be handled by an adult.) for drugging insects
Large kitchen strainers for catching reptiles and amphibians

Activity I Looking for evidence of animals

Where do animals make their homes?
How can we locate animals' homes?
What are some signs of animal inhabitation?
How can we find ants?
How can we tell if herbivorous animals have visited the site?
Where do we look for animal tracks?
What can we tell by animal tracks?
How does the evidence indicate that animals are dependent upon plants and other factors in their environments?

Activity 2 Kinds of animals that live in the soil

How do animals that live in soil litter differ from those that live underground?
How many stages of animal life are present in the soil?
What kinds of animals burrow and make tunnels?

How does the temperature of the surface of the soil differ from the temperature at different levels in the soil?
How does the temperature difference influence the animals that live on, and in, the soil?
How does the pressure vary under the surface?
How are animals adapted to living in the soil?
How do worms and other tunneling animals help plants?

Activity 3 Kinds of animals that live on plants

Where do we look for animals that live on plants?
During how many stages of animal life can animals live on plants?
How are animals that live on plants different from those that do not?
What are the animals living on the plants?
What kinds of flying insects live on plants?
In what ways are the animals that live on plants alike?
How do the animals that live on plants differ?
What kinds of animals live under logs?
What kinds of animals live under rocks?
Why should we return to their original positions logs and rocks that we have rolled over?

The students should follow their guide sheets and answer the questions by doing the following Activities. Activity I should be done first; Activities 2 and 3 may then be done either in sequence or simultaneously.

Activity I

The entire class should participate in the first part of this Activity. As soon as the class arrives at the site, all students should spread out in a large circle, locate themselves under trees, in grass, near logs, etc., and stand there quietly. They should scan the site, looking for movements in the treetops and grass and listening for the snapping of twigs, the rustling of leaves, and other sounds. During this quiet period, larger species not freightened out of the area by the noise of the class's arrival may venture out to survey what the disturbance was about. Squirrels and ground animals may peer out of their retreats, and birds may alight on the ground in plain view and begin feeding. As soon as a member of the class sees an animal, he should slowly and quietly raise his hand and point to it. Other members should be alert to what their classmates are doing and follow with their eyes where their classmates are pointing. After about 5 minutes of observing where the animals are and what they are doing, the class may break into its groups and begin the Activities. In dispersing, all groups should be careful not to thrash around in the grass and bushes, for this will scare away many of the insects and other animals.

The group may continue this first Activity by observing and recording with a camera more evidence of animal inhabitation. The students should scan the ground for ant mounds or for a "fairy ring," a distinct belt of vegetation that often encircles a nest of harvester ants. They should look for cropped grass, a sign that the site is visited by deer and other herbivorous mammals, and for young trees stripped of bark, a favorite food of beavers and other large rodents. Nutshells around the base of a tree may indicate a squirrel's nest high in the trunk. The students should also scan the ground for dead insects and animal debris, including droppings, shed cocoons, and ant wings (in the spring). Since the children will probably not be able to identify some of the things they find, they may pick them up with their hands or with tweezers and put them in boxes for transport back to school for further study and identification.

The children should also look for tracks in soft ground. By examining the kind of print (hoof or toes) and its depth, the children may speculate about the kind of animals that left the track. By measuring the space between prints, they may be able to determine whether it was walking or running. If the tracks are fairly deep and well defined, as fresh tracks in mud often are, the children can make a plaster of paris cast of the prints. To make a plaster cast, add water to plaster of paris until the mixture has the consistency of loose batter and is just thin enough to pour. Gently pour plaster into the tracks. After about 30 minutes the plaster will be dry, and the cast may be lifted. Back in class, the students may compare their cast with the illustrations in reference books to verify their guesses about the kind of animal that made the tracks.

The children should also look on the ground for burrows, up in trees for ~~bird's nests~~, and amoung the branches of bushes and trees and in the grass for spider webs and caterpillar cocoons. From these evident signs of animal inhabitation, the students should deduce how the animals that left the evidence are dependent upon the area for food and shelter.

Activity 2

After children have made broad observations of the area, they should begin more intensive investigations. Choose an area where there is a thick layer of soil litter, and carefully remove the dead leaves and other decaying matter, layer by layer. Notice which animals are near the top and which are burrowing through the litter. Using spoons, the students can scoop these species into tin cans and transfer them to a large jar containing some soil litter. The jar should be marked with a grease pencil or a felt-tip marker, indicating the kind of site where the species were found.

Then dig down into the ground with a shovel. In the unturned soil and along the sides of the hole, look for adult animals, purpae, larvae, egg sacs, and burrows and tunnels. When the hole is about 12 inches deep, have the students roughly compare the temperature and dampness of the surface of the soil with that at the bottom of the hole by feeling the soil with the backs of their hands. Point out that worms, larvae, and incubating eggs need moisture and that exposure to light causes them to dry out. Also relate the presence of worm and ant tunnels to the idea that plant roots and worms, beetles, ants, and other animals living underground need air.

By the following simple method, compare the pressure at the surface of the ground with the pressure underground. Have several students extend both hands. In one hand put a large handful of dirt; leave the other hand empty. The children will immediately be aware that dirt weighs more than air and should be able to relate this idea to the fact that pressure is greater underground than on the surface. The children may then discuss how the hard exoskeletons of some kinds of insects serve as protection against external pressure and how tunneling helps relieve the pressure on both soil-dwelling animals and plant roots.

If the students spot an ant mound, they may want to dig into it and take some ants back to the classroom for an ant farm. To obtain the ants, insert a shovel about 6 inches from the entrance to the nest and push it deep, pointing toward the entrance. You will probably expose some of the incubating chambers. Scratch through the nest and the clod or shovelful of dirt to get grubs (larvae), cocoons (purpae), and plenty of workers. Try to capture one or more queen ants, which can be distinguished by their large size. Put your captives in a jar containing soil from the nest, stretch a piece of cheesecloth across the mouth, and seal the jar with its lid.

Captured species, whether ants, grubs, or beetles, should be placed in bottles marked with the type of location in which the animal was found. If you prefer to kill and preserve the specimens, drop soft-bodied forms, like worms and larvae, into a container of 70% ethyl alcohol. Hard-bodied insects, such as beetles, may be placed in killing jars.

To make a killing jar, pack rubber bands into the bottom of a jar and soak them with carbon tetrachloride. (Carbona and other spot removers are composed of carbon tetrachloride. Caution: Do not sniff this chemical; its fumes are noxious.) Pack absorbent cotton over the soaked rubber bands, and over the cotton lay a disk of cork, perhaps cut from an old table mat. You may use jars of different sizes, and all jars, of course, should have tight lids.

Activity 3

Look for evidence of animals living on plants. Many animals live only on plants, and by examining the undersides of leaves, the notches between leaves and stems, flowers, fruits, and buds, the children should be able to discover numerous species of these animals. Observe what the animal is doing, noting whether it is inactive or if it appears to be eating the plant parts. Look for pupal stages, marked by cocoons; larvae, which generally do the greatest damage to plants because of their voracious appetities; and masses of eggs. (Hand lenses will be useful in finding the eggs.) Note how many different kinds of stages of animals are living on the same plant.

The children may choose a plant, clip off the parts containing animals, and drop the entire specimen in a preserving jar containing 70% ethyl alcohol. On the jar, put the name of the plant on which the animals were found. If the name is not known, identify the type as grass, bush, etc.

A few children may use nets to sweep through vegetation that has not been disturbed by other investigations and catch flying insects. With each step, the children should make a slow, even pass through the tops of the vegetation. The motion should somewhat resemble sweeping a floor in slow motion. After about twenty passes, each student should twist his net closed so that the specimens will not escape.

If the children do not wish to kill the specimens, have each sweeper bring his net to an old sheet spread out on the ground. Shake the contents of the net onto the sheet. Many interesting insects will go scurrying, hopping, and flying across the sheet, and the contrast between sheet and insect will make viewing easier. If children wish to preserve the specimens, have them shake the contents of the net into killing jars. After several minutes, transfer the dead insects to cigar boxes.

The students may also want to catch butterflies and moths. Since these insects struggle when caught and may injure their fragile wings, an adult may sprinkle a few drops of chloroform on the net before the hunt. (Caution: Chloroform is poisonous and explosive! It should always be handled by an adult.) The drugged insects may be shaken into the killing jar when caught. When dead, pick them out by grasping the bodies (not the wings!) with tweezers, and fold them in sheets of paper to prevent damage to the wings.

One or two boys, with the help of an adult if necessary, should slowly roll over a decaying log or a large stone. The other children should be ready to observe what goes scurrying away or burrows deeper when the log or stone is lifted. A few students should be ready with forceps or tin cans and spoons to capture slugs, centipedes, and millipedes. These may be put in jars containing some of the medium in which they were discovered, or preserved in 70% alcohol. Reptiles and amphibians may also be under the log or rock. These may be caught with kitchen strainers or nets and transferred to large jars. When the students have finished their observations, they should return the log or stone to its original position so that the habitat will not be destroyed for those animals remaining in it.

During the trip, children may have found gophers, salamanders, turtles, garter snakes, and other animals that may be carried back to school for further observation. Be sure you have prepared temporary homes, such as boxes and gallon jars with holes punched in the lids.

Follow Up

Preserved animals may be prepared for display. Soft-bodied specimens should remain in a preservative, like alcohol. Hard-bodied insects may be relaxed by leaving them several days on a damp sponge. They then may be arranged on pins. Live animals should be made as confortable as possible in artificial habitats. Many of these animals cannot be kept successfully in captivity. Many of them eat only other living animals, such as earthworms and mealworms. If adequate food and living conditions cannot be provided for the captives, they should be released in the area where they were found. All specimens should be correctly labeled. A good reference book or field guide should be correctly labeled. A good reference book or field guide should be used for label information.

All groups should prepare a summary of observations and correlate their learnings around the theme "Living Things Depend Upon Each Other and Their Environment." They could prepare a mural for the classroom or hall and display photographs and specimens from their trip.

PLANTS

*1. Develop a way of making a survey of the different types and distributions of plants that grow in a field.
2. Record the differences in characteristics of five different kinds of coniferous or deciduous trees.
3. Find evidences of attacks by insects or disease on plants.
4. Find out as much as you can about a tree or shrub through the use of the five senses.
5. Find examples which illustrate some of the principles of how plants grow and function.
*6. Observe the growth rings in a tree stump to determine how the environment has affected the tree through the years.
7. Compare the different methods that seeds use to travel from place to place.
8. Record the different vertical layers of plant life in a woods.
9. Study how plant growth is affected by light intensity.
10. Make a color chart to find how many different colors and shades of the same color you can find.
11. Compare the amount of the plant found above the ground level to that found below the ground level.
12. Compare the structure of the root systems from various kinds of plants and from the same kind of plant found in different locations.
13. Mark off quadrats of one square meter in different plant communities to compare the types of plants, amount of bare ground to that covered with vegetation, amount of basal area of each plant compared to the area covered by the foliage, light intensity, temperature of the air and soil, moisture present, soil compactness and water absorption rate, and air movement.

* Indicates a problem which may employ mathematical concepts in the solution.

14. Determine if mosses and lichens grow more abundantly on the north side of trees or rocks.
*15. Estimate the amount of water given off by a tree in one day through transpiration.
*16. Estimate the ages of living trees without cutting them down.
17. Find evidence of how fire affects plant growth.
18. Find the nodules on the root systems of legumes. View the nitrogen fixing bacteria under a microscope.
*19. Plan and plant an herb or vegetable garden.
20. Make a compost pile.
21. Find abandoned fields in various stages of succession and compare the types of vegetation found in each.
22. Find plants that have had various uses by man throughout history.
23. With a microscope, observe the cells in the leaf of a plant.

*24. Compare the approximate amount of area covered by the tree and shrub canopies of different forest species.
25. Use identification keys to classify and find out the names of plants.
26. Note the species of trees and shrubs found in certain types of locations such as lowlands, high places, or wet places.
27. Determine if different species of trees leaf out, flower, fruit, or bud at the same time of year. Determine if the same species of tree in different locations leafs out, flowers, fruits or buds at the same time of year.
28. Note if different species of trees grow at the same rate throughout the year. Note if the same species of tree in different locations grow at the same rate.
29. Mark off a plot of trees and determine which should be cut and which should remain in a managed woodlot.

ANIMALS

1. Compare the various kinds of animal tracks to note the number of toes or hoofs on the front and hind feet, the size of the track, the length and pattern of steps, and other clues to the habits of the animal.
2. Observe the behavior of animals such as ants or beetles, and note the methods of locomotion, other movements, reaction to heat, light, moisture, and touch.
3. Determine if grasshoppers and other jumping insects jump in the same direction when touched.
4. Compare the number and kind of animals found in a square foot of soil dug to a depth of six inches to the animals found in plots located in different places.
5. Make an analysis of materials found in nests and other protective shelters used by animals.
6. Trace an earthworm's burrow by digging in the soil.
7. Make a population census of small animals found in an area.
8. Note the animals and animal evidences found in the different vertical layers of vegetation in the forest.
9. Note the animals found in the different states of dead and decaying trees.
10. Record the type and number of birds visiting a feeding station.
11. On a vegetation map of an area, record where the most varieties of wildlife evidence are found.
12. Determine the diet of animals by examining their droppings.
13. Identify birds and their location to determine if they prefer certain habitats.
14. Compare the size of birds to that of the crow, robin, and English sparrow.
15. Record the most striking colors on various birds when they are perched or flying.
16. Observe and describe the behavior of birds.
*17. Estimate the number of birds in a flock.

18. Record the bird's flight pattern.
19. Describe the bird's song or call note.
20. Describe the bird's beak and determine how it is useful in obtaining food.
21. Observe how young birds are fed and cared for. Observe the colors of the plumage of the young birds.
22. Obtain a wing feather and make a sketch of its structure.
23. Describe the feet of the bird and determine how they are useful to the bird.
*24. Make a survey of insects and the plants on which their evidences are found. Estimate the total number of certain kinds of insects in an area.
25. Attempt to find the sources of pollen observed on bees.
26. Develop a dichotomous identification key for a selected number of insects or other animals found.
27. Layout a nature trail for the purpose of animal interpretation.
28. Make brush piles to provide animal food and cover.
*29. Determine different speeds of locomotion of ants, other animals, or of the students in the class.
30. Determine if the position of the sun has an affect on the navigation ability of certain insects.

WEATHER

*1. Determine if the temperature of the air varies in different places. Determine some of the factors which may cause these differences.
2. Design and make simple devices to measure the relative wind velocity and direction in different places and at different elevations.
*3. Devise a way of measuring the evaporation rate of water in different locations.
4. Find examples of weathering of natural and man-made rock.
5. Compare the different cloud types and estimate their elevation.
6. Determine the speed and direction of moving clouds.
7. Attempt to discover evidence of air pollution.
*8. Compare the relative humidity in different places and at different times of day.
*9. Find the air pressure at different elevations and at the same elevation during different times of the day.
10. Compare the amounts of radiation absorption in differently colored materials.
*11. Determine the temperature by using the chirps of a cricket.
12. Make weather forecasts based upon the readings of weather instruments.
13. Observe and compare the six basic shapes of snow flakes.
*14. Compare the various depths of snow in different places and determine the reasons for these differences.
*15. Record and compare the temperatures of the air, soil, and snow at different depths.

*16. Determine the amount of water in a cubic foot of snow and calculate the ratio of air to water.
17. Evaporate some snow and observe the residue.
18. Observe the effects of rock salt on snow.
19. Observe a cross-section of accumulated snow and compare it to the formation of certain types of rock.
20. Determine the acidity or alkalinity of melted snow or rain.
21. Compare the amount and texture of melting snow on a north-facing slope to that on a south-facing slope.
*22. Determine how much water will be accumulated from a specific amount of precipitation falling on a roof.
*23. Determine how far away a thunder storm is with the aid of thunder and lightning.

PONDS AND STREAMS

*1. Determine how different depths and locations affect the water temperature.
2. Determine some different ways in which aquatic plants and animals can be classified.
3. Find evidence of plants and animals that make up various food chains.
*4. Make a map of the different depths of a pond or stream.
*5. Measure the distance across the pond or stream.
6. Determine the types and quantities of plant and animal life found in different locations and at different depths.
7. Determine the acidity and alkalinity in different locations.
8. Determine the turbidity of the water in different locations.
9. Determine the composition of the bottom of the pond or stream in different locations.
*10. Compare the temperatures of the water to the temperatures of the soil around it.
11. Determine if the amount of sunlight and sunlight penetration affects the growth of aquatic vegetation.
12. Mark off the boundaries of the watershed of a pond.
*13. Determine the surface area and volume of water in a pond or section of stream.
14. Find evidence of water pollution.
15. Collect some oxygen given off by aquatic plants.
16. Make a vegetation map of the plants in and around the pond or stream.
17. Use a microscope to examine small plants and animals found in the water.
18. Find aquatic animals in different stages of growth.
19. Construct check dams along streams.
*20. Determine the rate of flow of a stream in various locations.
21. Determine the location of sediment deposition around the curves in a stream.

GEOLOGY

1. Determine how many different kinds of fossils can be found and develop a simple method of classifying them.
2. Find examples of how rock and man-made stone are used by man.
*3. Develop methods of measuring soil erosion in different places.
4. Determine effective methods for preventing and checking soil erosion.
5. Determine how many different kinds of soil can be found and classify them according to their characteristics.
*6. Compare the rates of water absorption into the ground in different locations.
*7. Determine the water holding capacity of different soils.
8. Compare rocks according to color, color streak, texture, hardness, luster, facric, fracture, density and other characteristics.
9. Compare the weathered surface of a rock to a freshly broken surface.
*10. Determine the dip and strike of a rock outcrop.
11. Find examples of ripple marks, faulting, and folding in rocks.
12. Using a geologic map of the area, find various kinds of exposed rock formations.
13. Classify the soil fractions according to size of particles and type of content. Determine the percentage of each soil fraction present.
*14. Compare the relative soil compactness in different places.
15. Compare the affects of soil color and vegetation coverage on the soil temperature.
*16. Compare the amounts of organic matter present in different soil samples.
17. Compare soil acidity and alkalinity and the amount of potassium, phosphorus, and nitrogen in different places.
18. After a rain, compare the amounts of soil erosion in different places.
19. Compare the relative amounts of air contained in different soil samples.
*20. Compare the depth of the topsoil in different locations.
21. Compare soil profiles in different locations.
22. Classify the land according to the Soil Conservation Service's eight classifications.
*23. Determine angles of crossbedding in sandstone rock.

MAPPING AND SURVEYING

*1. Make a map of an area using different methods.
*2. Determine the differences in elevation to find the water level of a pond if a dam of a certain height were constructed.
3. Fill in information about dominant vegetation on a base made from an aerial photograph.
*4. Mark off contour lines on a hillside and then make a contour map of the hill.

5. Find the location of bench marks with the aid of a topographic map.
*6. With a compass, determine the azimuths to landmarks within a sight. Walk to them and try to return to the starting point using only the compass.
*7. With a map and compass walk to landmarks that are not visible from the starting point.
*8. With a compass, walk the perimeter of an equilateral triangle and try to end up at the starting point.
*9. Measure land areas using different standard units such as a yard stick, tape measure, meter stick, forester's chain, or rod.
*10. Measure land areas using different non-standard units such as a yard stick, tape measure, meter stick, forester's chain, or rod.
*11. Compare the slope of the land to the amount of soil erosion in each place.
*12. Make a shadow clock to tell the time of day and relate the shadows to compass direction.

SOCIAL STUDIES

1. Find evidences of how man has affected the environment.
2. Find evidences of how the natural environment has affected man.
3. Determine why the early settler would choose a particular location for his home site.
4. Make a rough sketch map of a home site and other man-made features such as outbuildings, well, pond, road, or cellar.
5. Make a physical and cultural survey of an area.
6. Compare aerial photographs to the land. Obtain aerial photographs taken 20 or 30 years ago to observe the changes that have taken place.
7. At an old home site foundation, make a sketch of the building and vegetation as you think it might have looked when it was occupied by man.
8. With a compass in hand, set a bee-line course and hike cross-country. As you go record the human and physical geography on a topographic base map.
9. Obtain some old tools and figure out how man used them.
10. Make a fire with flint and steel and bow and drill.
11. By observing old buildings, figure out how they were constructed.
12. Examine old farm sites to determine what type of people lived there at various times.
13. Explore for artifacts which provide clues of how the people lived.
14. Explore a cemetery to discover the local history recorded on the grave stones and surroundings.

LANGUAGE ARTS

1. Write about the seasonal changes that might occur in your immediate location.
2. Try to imagine what your immediate location would be like in ten, fifty, or one hundred years.
3. Express your reactions to the natural environment through the medium of Haiku poetry.
4. Use figures of speech to describe the out-of-doors such as alliteration, metaphor, simile, hyperbole, or onomatopoeia.
5. Personify a tree in a cemetery, along an old road, or at a homesite.
6. Using the senses of hearing, touching, smelling, tasting, and observing, describe your impressions of objects of nature.
7. Choose something which appears at first to be ugly or not particularly beautiful. Describe the object again after looking carefully at it.
8. Observe and describe familiar shapes, forms, designs, or figures in objects such as gnarled wood, areas of light between tree branches, clouds, or rocks.
9. Write a story about a miniature world as magnified through a hand lens.
10. Write about the thoughts that occur as you are seated in the woods.
11. Compare the writings of poets such as Keats, Wordsworth, Sandburg, or Frost and the writings of authors such as Emerson, Thoreau, Burroughs, Muir, or Audubon to how you react to the same things that they write about in nature.
12. Dramatize stories about life in the woods.
13. While in the out-of-doors, construct an outline for a factual report of an experience.
14. Take field notes of important information discovered outdoors.
15. Write a ficticious diary of a person who might have: lived in an old house, travelled on old road, or played in the woods.
16. Examine the meaning of various words related to the out-of-doors.
17. Examine the sources of folk superstitions and sayings about the out-of-doors.
18. Compare how differently each person perceives his environment by having each one write about it and share what he has written.
19. Listen for a short time and list all the different kinds of sounds heard. Develop a system to increase your retention of new sounds heard.
20. Have the pupils compose the ending for an unfinished story about the out-of-doors.

ART

1. Find examples of characteristics of abstract art in nature.
2. Record how many colors you can observe in a small area delimited by a circle of two inch diameter.

3. Draw a picture about a story read in the outdoors.
4. Form the body into shapes of trees or other natural objects observed.
5. Make arrangements of dried grasses and other plants for decorative purposes.
6. Take photographs in the out-of-doors.
7. Squint the eyes to see differences in light and dark. Make a sketch of what you observe.
8. Find examples of lines and shapes in nature.
9. Find examples of design in movement.
10. Experiment with branches, feathers, bones, grasses, seeds, or other natural materials as paint brushes to create various effects such as massiveness or delicateness.
11. Use wood charcoal from a fire to make a sketch.
12. Find natural clay in a stream for modelling with the hands or a tool such as a stick or rock.
13. Use plant pigments from flowers, stems, fruits, leaves, and/or rotted wood to make a sketch on fine sandpaper or paper.
14. Make a collage of pebbles, seeds, or other plant parts using surfaces such as a slab of wood or cardboard.
15. Represent textures in nature such as tree bark, rock, or seed pod surfaces with modelling clay.
16. Find different surfaces to draw or paint upon such as pieces of wood, bark, or rock, packed soil, woven grass mats, or leaves.
17. Make natural paints and dyes with plants, muddy water, or other natural colors.
18. Use objects such as wood, bark, seeds, leaves, or other natural objects to make prints on paper or cloth.
19. Cut designs in vegetables such as a potato or turnip for block printing.
20. Weave grasses and other vegetation into mats.
21. Make animal figures out of objects such as twigs, stones, and seeds.
22. Carve from soft wood or tree bark.
23. Find different shades of the same colors.
24. Make sand castings with mud, clay, or plaster of Paris.
25. Make clay masks of Indian faces while at the Indian shelter.
26. Make twine or rope from the inner bark of certain trees.
27. Construct mobiles using natural materials.

MUSIC

1. Make different sounds and rhythms from the objects of nature such as stones, seeds, sticks, or dry grass.
2. Dance to natural rhythms and sounds such as the wind in the trees or grasses, the flowing water, or the calls of insects or other animals.
3. Make a willow whistle.
4. Imitate animal sounds.

5. Using a tape recorder, record animal sounds.
6. While listening to tape recordings of music related to the outdoors, determine how the composer represents nature's sounds and rhythms.
7. Compose songs based on outdoor experiences.

HEALTH AND SAFETY

1. Learn how to identify edible and poisonous plants.
2. Gather some edible wild plants and understand their food values.
3. Identify poison ivy by the leaves, by the woody branches or vines, and by the fruits.

OUTDOOR EDUCATION CENTER FOR SOUTHERN ILLINOIS

SOUTHERN ILLINOIS UNIVERSITY

Suggested School Site Outdoor Education Activities for Primary Grades

A. Trees and Shrubs
   1. Sketching tree shapes (silhouettes).
   2. Estimating height in relation to pupils.
   3. Studying bark patterns, textures, colors.
   4. Finding root systems (exposed by erosion).
   5. Comparing deciduous and coniferous tree characteristics.
   6. Comparing fruits, seeds, buds, leaf scars, leaves.
   7. Measuring distance around (circumference) and distance through the center (diameter) with a string tape measure. marked off with knots one inch apart.
   8. Comparing trees and shrubs.
   9. Testing bark thickness.

B. Stumps and Posts
   1. Figuring the method used in cutting and possible reasons for cutting.
   2. Rubbing with pencil or crayon on paper to get an impression (tracing) of the growth rings.
   3. Finding decay and insect evidence.
   4. Finding clues that show what forces are acting on the stump.
   5. Comparing wood that has been painted or treated with other preservatives to untreated wood.
   6. Figuring out why posts have been put into the ground in certain locations.

C. Grass and Other Vegetation
   1. Finding effects of people, animals, sunlight, shade, wind, water, etc. on plant growth.
   2. Finding locations where plants grow (cracks in sidewalks, school buildings, tree stumps, etc.)
   3. Tasting wild onion.
   4. Finding effects of plants on erosion and erosion on plants.
   5. Studying small, measured plots of ground for strengthening observation skills.
   6. Rubbing plant pigments on sandpaper.
   7. Keeping records of the heights of small plants with strips of colored paper by gluing the strips to a piece of cardboard to make a growth graph.
   8. Studying the roots of grass or other plants by carefully washing away the soil.

9. Tossing a wire hanger ring to study plants in a lawn.
10. Comparing how seeds travel from place to place.

D. Shadows
1. Estimating length of shadow in relation to object casting it.
2. Marking the position of the shadow on the ground with chalk or sticks. (Note the change in length and position after a few minutes, and hours.) (What causes the shadow to move?)
3. Comparing the shadows cast by the flag pole, posts, trees, persons, buildings, etc.
4. Comparing shapes of shadows to the object casting the shadow.
5. Observing how shadows fall according to the position of the sun.

E. Sidewalks
1. Examining what they are made from and how they are made.
2. Finding plants growing in cracks.
3. Finding wearing away by forces of weather and people.
4. Finding soil washed onto them and determining where it came from.
5. Studying where the sidewalks have been placed and where they are needed.
6. Finding where tree roots have pushed up the sidewalk.

F. Animal Life
1. Observing birds, squirrels, insects, etc. (Bird clue outline sketching.)
2. Finding animal homes (under logs and rocks, in tree bark, holes in trees, nests, etc.)
3. Finding tracks in the mud (including human) and taking plaster of Paris casts of them.
4. Finding other evidence (cocoons, droppings, borings, earthworm holes, beetle borings, etc.)
5. Establishing bird feeding stations near a window. (Simple feeders may be made from pine cones, coconut halves, holes drilled into a small log, or similar containers for suet. Try a mixture of seeds, Crisco, peanut butter, and bacon fat.)
6. Keep records of when birds arrive.
7. Noticing how carelessly dropped food is quickly eaten and carried away by various animals.

G. Weather
1. Comparing cloud formations.
2. Finding wind speed with wind measurer (card and thread) and flag movement.
3. Finding wind direction with balloons and bird feather vane.
4. Comparing effects of objects (such as buildings or vegetation) on wind.
5. Exploring little climates (differences in temperature in different places on the school ground).
6. Seeing the effect of rain on soil erosion (set up splash boards and water soil with watering can).
7. Tracing rain that falls on the school building. (Where does it go? Roof, gutter, drain culvert, etc.)
8. Examining weathering on bricks, wood, and paint on school buildings.
9. Illustrating air pollution by holding clean cloth in smoke.
10. Observing where a puddle had dried up.
11. Finding where ice or snow is melting.

H. Soil and Water
1. Comparing size of soil particles. (Shake up soil in a jar of water and let it settle.)
2. Comparing color of soil in different places.
3. Smelling soil to find out if it has an odor.
4. Comparing color and moisture of soil from the surface to two feet deep (use a soil auger).
5. Measuring soil compaction in different places. (Use a soil compaction gauge.)
6. Finding out how fast water soaks into the ground in different places. (Bottomless tin can sunk in ground.)
7. Comparing erosion at different places on the school ground. (Noting evidences of erosion, i. e. deltas, gullies, exposed roots, etc.)
8. Examining soil with a hand lens. Separating the parts of soil into piles of the same material. (Pebbles, roots, leaves, sand, etc.)
9. Listening to different soils when rubbed between the fingers and held to the ear.
10. Measuring the temperature of the soil in different spots.
11. Squeezing samples of different kinds of soil together to see if they form a ball.
12. Collecting some muddy water from some puddles or drainage ditches. Allow the suspended soil to settle to the bottom. Compare the amounts of soil in different places.
13. Pouring some water into a jar of soil. Noticing the air bubbles that rise to the top.
14. Measuring root exposure or the depth of gullies with strips of paper. Paste them to a piece of cardboard to record measurements of soil erosion in different places.

15. Comparing plant growth in different kinds of soil.

I. Rocks and Minerals
   1. Making soil by rubbing two rocks together.
   2. Arranging rocks according to color, texture, hardness, luster, fabric and other characteristics.
      a. Scratching rock on sandpaper or unglazed porcelain tile for color streak.
      b. Examining a rock with a hand lens to see the size of the particles. (Texture)
      c. Rubbing two rocks together to see which one makes a scratch in the other. (Hardness)
      d. Observing if the surface of the rock or mineral reflects light or appears shiny. (Luster)
   3. Finding rocks that break differently by comparing edges.
   4. Finding rocks that have been worn smooth by water or cracked by the weather. (Comparing a freshly broken surface with a weathered one.)
   5. Comparing man-made rock (bricks) to naturally made rock.
   6. Comparing the weights of the different kinds of rocks of the same size.
   7. Finding different kinds of fossils.
   8. Making impressions of fossils in clay.
   9. Finding where plants are growing on and slowly breaking down rocks.
   10. Making a survey of the different kinds of rocks on the school grounds.
   11. Finding rocks that show signs of rusting.
   12. Finding ways that rocks are useful to man.

J. Art
   1. Finding "lines" in the environment:
      a. circle - sun, moon, berry, woodpecker's hole.
      b. zig-zag - tree rings, edges of leaves, building and trees on the horizon.
      c. wavy - path of a brook, ripple of water, soil.
      d. straight - tree trunk, vein in a leaf, a pine needle, a blade of grass.
      e. finding other shapes in the environment.
   2. Finding design in movement:
      a. draw lines to show how different birds fly.
      b. draw lines to show how branches wave in the wind.
      c. draw lines to show how clouds move in the sky.
   3. Finding design in sound:
      a. draw a sound the way it might be put down on paper using dots, light lines, dark lines, zig-zags, spirals, straight and wavy lines. (Wind in grass and trees, squirrel's, dog's bark.)
   4. Finding design in color:
      a. using rocks, sticks, leaves, etc. rub on sandpaper to see the color.

5. Finding design in texture.
    a. draw and describe the following; bark of trees, stumps, blade of grass, sidewalk, feather.
6. Constructing collages from natural materials such as cones, pebbles, twigs, leaves, etc.

K. Pond
1. Netting and studying pond plants and animals.
2. Finding the average depth of the pond.
3. Making a simple map of the pond.
4. Finding the temperature of the water in different places and at different levels.
5. Using a microscope and hand lens to discover microorganisms.
6. Finding where the plant and animal life is most abundant in and around the pond.
7. Finding evidence of water pollution.

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